FILE

SCS ENGINEERS

Hardee County Landfill Expansion
Construction Permit Application
Hardee County, Florida
Volume 1 of 2

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
APR - 8 2004
SOUTHWEST DISTRICT
TAMPA

Prepared for:

Hardee County
Board of County Commissioners
412 West Orange Street
Wauchula, Florida 33873

Prepared by:

SCS Engineers
3012 U.S. Highway 301 North
Suite 700
Tampa, Florida 33619
(813) 621-0080

INCLUDES INFORMATION RECEIVED
11/19/04, 5/23/05, 11/30/05 and 1/25/06

April 2004
File No. 09199033.09

Environmental Consultants
3012 U.S. Highway 301 North
Suite 700
Tampa, FL 33619-2242
813 621-0080
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SCS ENGINEERS

April 8, 2004
File No. 09199033.09

Mr. Kim B. Ford, P.E.
Florida Department of Environmental Protection
Southwest District
3804 Coconut Palm Drive
Tampa, Florida 33619

D.E.P.
APR 08 2004
Southwest District Tampa

Subject: Construction Permit Application
Hardee County Landfill Expansion
Hardee County, Florida

Dear Mr. Ford:

On behalf of the Hardee County Department of Solid Waste, SCS Engineers (SCS) is pleased to provide four copies of the attached construction permit application for the Landfill Expansion at the Hardee County Landfill, Hardee County, Florida. The permit application includes an expansion area of approximately 10 acres.

Please call if you have any questions.

Very truly yours,

Joseph H. O'Neill, P.E.
Project Manager
SCS ENGINEERS

Raymond J. Dever, P.E., DEE
Vice President
SCS ENGINEERS

JHO/RJD:jlh

Enclosure

Security enhanced document. See back for details.

SCS ENGINEERS
PHONE 813-621-0080
3012 U.S. HIGHWAY 301 N., STE. 700
TAMPA, FL 33619

5832

63-27/631 FL 28

DATE 4/2/04

PAY TO THE ORDER OF Florida Department of Environmental Protection $ 100.00

One hundred and no/100-- DOLLARS

Bank of America

ACH R/T 063100277

FOR Solid Waste Permit

⑈005832⑈ ⑆063100277⑆ 003600948423⑈

Florida Department of Environmental Protection

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, FL 32399-2400

DEP Form # 62-701.900(1)
Form Title Solid Waste Management Facility Permit
Effective Date 05-27-01

DEP Application No. ______________
(Filled by DEP)

D.E.P.
APR 08 2004
Southwest District Tampa

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

APPLICATION FOR A PERMIT TO CONSTRUCT, OPERATE, MODIFY OR CLOSE A SOLID WASTE MANAGEMENT FACILITY

APPLICATION INSTRUCTIONS AND FORMS

Hardee County Regional Landfill Expansion
Construction Permit Application
File No. 09199033.09

INSTRUCTIONS TO APPLY FOR A SOLID WASTE MANAGEMENT FACILITY PERMIT

I. General

Solid Waste Management Facilities shall be permitted pursuant to Section 403.707, Florida Statutes,(FS) and in accordance with Florida Administrative Code (FAC) Chapter 62-701. A minimum of four copies of the application shall be submitted to the Department's District Office having jurisdiction over the facility. The appropriate fee in accordance with Rule 62-701.315, FAC, shall be submitted with the application by check made payable to the Department of Environmental Protection (DEP).

Complete appropriate sections for the type of facility for which application is made. Entries shall be typed or printed in ink. All blanks shall be filled in or marked "not applicable" or "no substantial change". Information provided in support of the application shall be marked "submitted" and the location of this information in the application package indicated. The application shall include all information, drawings, and reports necessary to evaluate the facility. Information required to complete the application is listed on the attached pages of this form.

II. Application Parts Required for Construction and Operation Permits

A. Landfills and Ash Monofills - Submit parts A,B, D through T
B. Asbestos Monofills - Submit parts A,B,D,E,F,G,J,L,N, P through S, and T
C. Industrial Solid Waste Facilities - Submit parts A,B, D through T
D. Non-Disposal Facilities - Submit parts A,C,D,E,J,N,S and T

NOTE: Portions of some parts may not be applicable.

NOTE: For facilities that have been satisfactorily constructed in accordance with their construction permit, the information required for A,B,C and D type facilities does not have to be resubmitted for an operation permit if the information has not substantially changed during the construction period. The appropriate portion of the form should be marked "no substantial change".

III. Application Parts Required for Closure Permits

A. Landfills and Ash Monofills - Submit parts A,B,M, O through T
B. Asbestos Monofills - Submit parts A,B,N, P through T
C. Industrial Solid Waste Facilities - Submit parts A,B, M through T
D. Non-Disposal Facilities - Submit parts A,C,N,S and T

NOTE: Portions of some parts may not be applicable.

IV. Permit Renewals

The above information shall be submitted at time of permit renewal in support of the new permit. However, facility information that was submitted to the Department to support the expiring permit, and which is still valid, does not need to be re-submitted for permit renewal. Portions of the application not re-submitted shall be marked "no substantial change" on the application form.

V. Application Codes

S	-	Submitted
LOCATION	-	Physical location of information in application
N/A	-	Not Applicable
N/C	-	No Substantial Change

VI. LISTING OF APPLICATION PARTS

PART A: GENERAL INFORMATION

PART B: DISPOSAL FACILITY GENERAL INFORMATION

PART C: NON-DISPOSAL FACILITY GENERAL INFORMATION

PART D: PROHIBITIONS

PART E: SOLID WASTE MANAGEMENT FACILITY PERMIT REQUIREMENTS, GENERAL

PART F: LANDFILL PERMIT REQUIREMENTS

PART G: GENERAL CRITERIA FOR LANDFILLS

PART H: LANDFILL CONSTRUCTION REQUIREMENTS

PART I: HYDROGEOLOGICAL INVESTIGATION REQUIREMENTS

PART J: GEOTECHNICAL INVESTIGATION REQUIREMENTS

PART K: VERTICAL EXPANSION OF LANDFILLS

PART L: LANDFILL OPERATION REQUIREMENTS

PART M: WATER QUALITY AND LEACHATE MONITORING REQUIREMENTS

PART N: SPECIAL WASTE HANDLING REQUIREMENTS

PART O: GAS MANAGEMENT SYSTEM REQUIREMENTS

PART P: LANDFILL CLOSURE REQUIREMENTS

PART Q: CLOSURE PROCEDURES

PART R: LONG TERM CARE REQUIREMENTS

PART S: FINANCIAL RESPONSIBILITY REQUIREMENTS

PART T: CERTIFICATION BY APPLICANT AND ENGINEER OR PUBLIC OFFICER

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
APPLICATION FOR A PERMIT TO CONSTRUCT, OPERATE, MODIFY OR CLOSE
A SOLID WASTE MANAGEMENT FACILITY

Please Type or Print

A. GENERAL INFORMATION

1. Type of facility (check all that apply):

[✔] Disposal
- [✔] Class I Landfill
- [ ] Class II Landfill
- [ ] Class III Landfill
- [ ] Other Describe: ______
- [ ] Ash Monofill
- [ ] Asbestos Monofill
- [ ] Industrial Solid Waste

[ ] Non-Disposal
- [ ] Incinerator For Non-biomedical Waste
- [ ] Waste to Energy Without Power Plant Certification
- [ ] Other Describe: ______

NOTE: Waste Processing Facilities should apply on Form 62-701.900(4), FAC; Land Clearing Disposal Facilities should notify on Form 62-701.900(3), FAC; Compost Facilities should apply on Form 62-701.900(10), FAC; and C&D Disposal Facilities should apply on Form 62-701.900(6), FAC

2. Type of application:
- [ ] Construction
- [ ] Operation
- [✔] Construction/Operation
- [ ] Closure

3. Classification of application:
- [✔] New
- [ ] Renewal
- [ ] Substantial Modification
- [ ] Intermediate Modification
- [ ] Minor Modification

4. Facility name: Hardee County Landfill

5. DEP ID number: SWD-25-40612 County: Hardee

6. Facility location (main entrance): 685 Airport Road approximately one mile north of SR 636 Wauchula, Florida

7. Location coordinates:

Section: 35 Township: 33S Range: 25E

Latitude: 27 ° 34 ' 16 " Longitude: 81 ° 46 ' 59 "

D.E.P.
MAY 23 2005
Southwest District Tampa

DEP FORM 62-701.900(1)
Effective 05-27-01

8. Applicant name (operating authority): Hardee County Solid Waste Department

Mailing address: 685 Airport Road | Wauchula | FL | 33873
Street or P.O. Box | City | State | Zip

Contact person: Janice Williamson Telephone: (863) 773-5089

Title: Solid Waste Director

Janice.Williamson@Hardeecounty.net
E-Mail address (if available)

9. Authorized agent/Consultant: SCS Engineers

Mailing address: 3012 U.S. Highway 301 North, Suite 700 | Tampa | FL | 33619
Street or P.O. Box | City | State | Zip

Contact person: Raymond J. Dever, P.E. Telephone: (813) 621-0080

Title: Vice President

rdever@scsengineers.com
E-Mail address (if available)

10. Landowner(if different than applicant): (same)

Mailing address: ______
Street or P.O. Box | City | State | Zip

Contact person: ______ Telephone: (___) ______

______
E-Mail address (if available)

11. Cities, towns and areas to be served: Hardee County, including its municipalities

12. Population to be served:

Current: 28,178 (2004) Five-Year Projection: 30,484 (2009)

13. Date site will be ready to be inspected for completion: 4/1/06

14. Expected life of the facility: Phase II Section I - 5 yr. years
Phase II Section II - 20 yr. (Total)

15. Estimated costs:

Total Construction: $ Phase II, Section I $1,840,000 Sideslope $670,000 Closing Costs: $ $2,200,000 Phase I Phase II, Section I

16. Anticipated construction starting and completion dates:

From: Cell 1/29/05 Sideslope 11/25/05 To: Cell 9/12/05 Sideslope 2/27/06

17. Expected volume or weight of waste to be received:

______ yds^3/day 66.5 (Est. 2004) tons/day ______ gallons/day

B. DISPOSAL FACILITY GENERAL INFORMATION

1. Provide brief description of disposal facility design and operations planned under this application:

   Construction permit for Hardee County's Class I Landfill Expansion - Approximately 5 acre double lined expansion immediately south of the existing disposal area. This expansion area is designed as Phase II Section I.

   The Phase II Section II expansion area, approximately 5 acre, is immediately west of the existing disposal area.

2. Facility site supervisor: Janice Williamson

   Title: Solid Waste Director   Telephone: (863) 773-5089

   Janice.Williamson@Hardeecounty.net
   E-Mail address (if available)

3. Disposal area: Total 22.5 acres; Used 12.5 acres; Available 10 acres.

4. Weighing scales used: [✓] Yes [ ] No

5. Security to prevent unauthorized use: [✓] Yes [ ] No

6. Charge for waste received: ________ $/yds^3 62.50 $/ton

7. Surrounding land use, zoning:

   [ ] Residential   [ ] Industrial
   [✓] Agricultural   [ ] None
   [ ] Commercial   [ ] Other Describe: ________

8. Types of waste received:

   [✓] Residential   [✓] C & D debris
   [✓] Commercial   [✓] Shredded/cut tires
   [ ] Incinerator/WTE ash   [✓] Yard trash
   [ ] Treated biomedical   [ ] Septic tank
   [ ] Water treatment sludge   [ ] Industrial
   [ ] Air treatment sludge   [ ] Industrial sludge
   [✓] Agricultural   [ ] Domestic sludge
   [✓] Asbestos
   [✓] Other Describe: Non-hazardous contaminated soil

9. Salvaging permitted: [ ] Yes [✓] No

10. Attendant: [✓] Yes [ ] No   Trained operator: [✓] Yes [ ] No

11. Spotters: Yes [✓] No [ ] Number of spotters used: Varies

12. Site located in: [ ] Floodplain [ ] Wetlands [✓] Other Uplands

13. Property recorded as a Disposal Site in County Land Records: [ ] Yes [✔] No

14. Days of operation: 312 days/year - Monday through Saturday

15. Hours of operation: 7:30 a.m. - 5:00 p.m.

16. Days Working Face covered: 312

17. Elevation of water table: ______ Ft. (NGVD 1929) Varies Across site (__78.5_South_) 81.5 North

18. Number of monitoring wells: Phase II Section I 8; Phase II Section II 9

19. Number of surface monitoring points: 1

20. Gas controls used: [ ] Yes [✔] No Type controls: [ ] Active [ ] Passive

Gas flaring: [ ] Yes [✔] No Gas recovery: [ ] Yes [✔] No

21. Landfill unit liner type:

[ ] Natural soils
[ ] Single clay liner
[ ] Single geomembrane side
[ ] Single composite
[ ] Slurry wall
[ ] Other Describe: ______

[✔] Double geomembrane
[ ] Geomembrane & composite
[ ] Double composite
[ ] None

22. Leachate collection method:

[✔] Collection pipes
[✔] Geonets
[ ] Well points
[ ] Perimeter ditch
[ ] Other Describe: ______

[✔] Sand layer
[ ] Gravel layer
[ ] Interceptor trench
[ ] None

23. Leachate storage method:

[✔] Tanks
[ ] Surface impoundments
[ ] Other Describe: ______

24. Leachate treatment method:

[ ] Oxidation
[ ] Secondary
[ ] Advanced
[ ] None
[✔] Other No on-site treatment (storage only). Off-site disposal at WWTP

[ ] Chemical treatment
[ ] Settling

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25. Leachate disposal method:

- [ ] Recirculated
- [✔] Transported to WWTP
- [ ] Injection well
- [ ] Evaporation
- [ ] Other ______
- [ ] Pumped to WWTP
- [ ] Discharged to surface water
- [ ] Percolation ponds

26. For leachate discharged to surface waters:

Name and Class of receiving water: N/A

27. Storm Water:

Collected: [✔] Yes [ ] No

Type of treatment: Detention

Name and Class of receiving water: Peace River, Class III

28. Environmental Resources Permit (ERP) number or status:

~~25-0124892-001 Leachate Storage Tank Facility (Existing)~~
407767.00 Waste Recycle Center (Existing)
477767.02 Animal Control Building (Existing)
ERP for Expansion (submitted and in review by FDEP)

Not Applicable

C. **NON-DISPOSAL FACILITY GENERAL INFORMATION**

1. Provide brief description of the non-disposal facility design and operations planned under this application:

____

____

____

____

2. Facility site supervisor: ______________________

Title: ______________ Telephone: (___) ______________

____
E-Mail address (if available)

3. Site area: Facility __________ acres; Property __________ acres

4. Security to prevent unauthorized use: [ ] Yes [ ] No

5. Site located in: [ ] Floodplain [ ] Wetlands [ ] Other __________

6. Days of operation: ______________________

7. Hours of operation: ______________________

8. Number of operating staff: ______________

9. Expected useful life: _______ Years

10. Weighing scales used: [ ] Yes [ ] No

11. Normal processing rate: _______ yd^3/day _______ tons/day _______ gal/day

12. Maximum processing rate: _______ yd^3/day _______ tons/day _______ gal/day

13. Charge for waste received: ______________________

14. Storm Water Collected: [ ] Yes [ ] No

Type of treatment: ______________________

Name and Class of receiving water: ______________________

15. Environmental Resources Permit (ERP) number or status: ______________

____

16. Final residue produced:

_______ % of normal processing rate _______ % of maximum processing rate

_______ Tons/day _______ Tons/day

Disposed of at:

Facility name: ______________ County: ______________

17. Estimated operating costs: $ ________________

Total cost/ton: $ ____________________ Net cost/ton: $ ____________________

18. Provide a site plan, at a scale not greater than 200 feet to the inch, which shows the facility location and identifies the proposed waste and final residue storage areas, total acreage of the site, and any other features which are relevant to the prohibitions or location restrictions in Rule 62-701.300, FAC, such as water bodies or wetlands on or within 200 feet of the site, and potable water wells on or within 500 feet of the site.

19. Provide a description of how the waste and final residue will be managed to not be expected to cause violations of the Department's ground water, surface water or air standards or criteria

20. Provide an estimate of the maximum amount of waste and final residue that will be store on-site.

21. Provide a detailed description of the technology use at the facility and the functions of all processing equipment that will be utilized. The descriptions shall explain the flow of waste and residue through all the proposed unit operations and shall include: (1) regular facility operations as they are expected to occur; (2) procedures for start up operations, and scheduled and unscheduled shut down operations; (3) potential safety hazards and control methods, including fire detection and control; (4) a description of any expected air emissions and wastewater discharges from the facility which may be potential pollution sources; (5) a description and usage rate of any chemical or biological additives that will be used in the process; and (6) process flow diagrams for the facility operations.

22. Provide a description of the loading, unloading and processing areas.

23. Provide a description of the leachate control system that will be used to prevent discharge of leachate to the environment and mixing of leachate with stormwater. Note: Ground water monitoring may be required for the facility depending on the method of leachate control used.

24. Provide an operation plan for the facility which includes: (1) a description of general facility operations, the number of personnel responsible for the operations including their respective job descriptions, and the types of equipment that will be used at the facility; (2) procedures to ensure any unauthorized wastes received at the site will be properly managed; (3) a contingency plan to cover operation interruptions and emergencies such as fires, explosions, or natural disasters; (4) procedures to ensure operational records needed for the facility will be adequately prepared and maintained; and (5) procedures to ensure that the wastes and final residue will be managed to not be expected to cause pollution.

25. Provide a closure plan that describes the procedures that will be implemented when the facility closes including: (1) estimated time to complete closure; (2) procedures for removing and properly managing or disposing of all wastes and final residues; (3) notification of the Department upon ceasing operations and completion of final closure.

D. PROHIBITIONS (62-701.300, FAC)

S	LOCATION	N/A	N/C		
✔	Section D.1			1.	Provide documentation that each of the siting criteria will be satisfied for the facility; (62-701.300(2), FAC)
✔	Section D.2			2.	If the facility qualifies for any of the exemptions contained in Rules 62-701.300(12) through (16), FAC, then document this qualification(s).
✔	Section D.3			3.	Provide documentation that the facility will be in compliance with the burning restrictions; (62-701.300(3), FAC)
✔	Section D.4			4.	Provide documentation that the facility will be in compliance with the hazardous waste restrictions; (62-701.300(4), FAC)
✔	Section D.5			5.	Provide documentation that the facility will be in compliance with the PCB disposal restrictions; (62-701.300(5), FAC)
✔	Section D.6			6.	Provide documentation that the facility will be in compliance with the biomedical waste restrictions; (62-701.300(6), FAC)
✔	Section D.7			7.	Provide documentation that the facility will be in compliance with the Class I surface water restrictions; (62-701.300(7), FAC)
✔	Section D.8			8.	Provide documentation that the facility will be in compliance with the special waste for landfills restrictions; (62-701.300(8), FAC)
		✔		9.	Provide documentation that the facility will be in compliance with the special waste for waste-to-energy facilities restrictions; (62-701.300(9), FAC)
✔	Section D.10			10.	Provide documentation that the facility will be in compliance with the liquid restrictions; (62-701.300(10), FAC)
✔	Section D.11			11.	Provide documentation that the facility will be in compliance with the used oil restrictions; (62-701.300(11), FAC)

E. **SOLID WASTE MANAGEMENT FACILITY PERMIT REQUIREMENTS, GENERAL** (62-701.320, FAC)

S	LOCATION	N/A	N/C		
✔				1.	Four copies, at minimum, of the completed application form, all supporting data and reports; (62-701.320(5)(a),FAC)
✔				2.	Engineering and/or professional certification (signature, date and seal) provided on the applications and all engineering plans, reports and supporting information for the application; (62-701.320(6),FAC)
✔				3.	A letter of transmittal to the Department; (62-701.320(7)(a),FAC)
✔				4.	A completed application form dated and signed by the applicant; (62-701.320(7)(b),FAC)
✔				5.	Permit fee specified in Rule 62-701.315, FAC in check or money order, payable to the Department; (62-701.320(7)(c),FAC)
✔				6.	An engineering report addressing the requirements of this rule and with the following format: a cover sheet, text printed on 8 1/2 inch by 11 inch consecutively numbered pages, a table of contents or index, the body of the report and all appendices including an operation plan, contingency plan, illustrative charts and graphs, records or logs of tests and investigations, engineering calculations; (62-701.320(7)(d),FAC)
✔	Section L			7.	Operation Plan and Closure Plan; (62-701.320(7)(e)1,FAC)
✔	Section L			8.	Contingency Plan; (62-701.320(7)(e)2,FAC)
				9.	Plans or drawings for the solid waste management facilities in appropriate format (including sheet size restrictions, cover sheet, legends, north arrow, horizontal and vertical scales, elevations referenced to NGVD 1929) showing; (62-702.320(7)(f),FAC)
✔	Cover Sheet Attachment E-2			a.	A regional map or plan with the project location;
✔	Sheet 2 of Drawings			b.	A vicinity map or aerial photograph no more than 1 year old;
	Sheet 3 of Drawings			c.	A site plan showing all property boundaries certified by a registered Florida land surveyor;

S	LOCATION	N/A	N/C		PART E CONTINUED
✔					d. Other necessary details to support the engineering report.
✔	Section E.10			10.	Documentation that the applicant either owns the property or has legal authority from the property owner to use the site; (62-701.320(7)(g),FAC)
✔	Section E.11			11.	For facilities owned or operated by a county, provide a description of how, if any, the facilities covered in this application will contribute to the county's achievement of the waste reduction and recycling goals contained in Section 403.706,FS; (62-701.320(7)(h),FAC)
✔	Section E.12			12.	Provide a history and description of any enforcement actions taken by the Department against the applicant for violations of applicable statutes, rules, orders or permit conditions relating to the operation of any solid waste management facility in this state; (62-701.320(7)(i),FAC)
✔	Section E.13			13.	Proof of publication in a newspaper of general circulation of notice of application for a permit to construct or substantially modify a solid waste management facility; (62-702.320(8),FAC)
✔	Section E.14			14.	Provide a description of how the requirements for airport safety will be achieved including proof of required notices if applicable. If exempt, explain how the exemption applies; (62-701.320(13),FAC)
✔	Section L			15.	Explain how the operator training requirements will be satisfied for the facility; (62-701.320(15), FAC)

F. LANDFILL PERMIT REQUIREMENTS (62-701.330, FAC)

S	LOCATION	N/A	N/C		
✔	Section F.1 Sheet 2 of Drawings			1.	Vicinity map or aerial photograph no more than 1 year old and of appropriate scale showing land use and local zoning within one mile of the landfill and of sufficient scale to show all homes or other structures, water bodies, and roads other significant features of the vicinity. All significant features shall be labeled; (62-701.330(3)(a),FAC)
✔	Section F.2			2.	Vicinity map or aerial photograph no more than 1 year old showing all airports that are located within five miles of the proposed landfill; (62-701.330(3)(b),FAC)
✔				3.	Plot plan with a scale not greater than 200 feet to the inch showing; (62-701.330(3)(c),FAC)
✔	Sheets 9,10			a.	Dimensions;
✔	Sheets 9,10,12,13			b.	Locations of proposed and existing water quality monitoring wells;
✔	Sheets 4,5			c.	Locations of soil borings;
✔	Sheets 9,10,12,13			d.	Proposed plan of trenching or disposal areas;
✔	Sheets 16,17			e.	Cross sections showing original elevations and proposed final contours which shall be included either on the plot plan or on separate sheets;
✔	Sheets 4,5			f.	Any previously filled waste disposal areas;
✔	Sheet 3			g.	Fencing or other measures to restrict access.
				4.	Topographic maps with a scale not greater than 200 feet to the inch with 5-foot contour intervals showing; (62-701.330(3)(d),FAC):
✔	Sheets 9,10,12,13,14			a.	Proposed fill areas;
✔	Sheet 8			b.	Borrow areas;
✔	Sheets 4,5			c.	Access roads;
✔	Sheets 10,13,14			d.	Grades required for proper drainage;
✔	Sheets 16,17			e.	Cross sections of lifts;

S	LOCATION	N/A	N/C		PART F CONTINUED
✔	Sheet 8				f. Special drainage devices if necessary;
✔	Sheet 3				g. Fencing;
✔	Sheet 3				h. Equipment facilities.
				5.	A report on the landfill describing the following; (62-701.330(3)(e),FAC)
✔	Section F.5.a				a. The current and projected population and area to be served by the proposed site;
✔	Section F.5.b				b. The anticipated type, annual quantity, and source of solid waste, expressed in tons;
✔	Section F.5.c				c. The anticipated facility life;
✔	Section F.5.d				d. The source and type of cover material used for the landfill.
✔				6.	Provide evidence that an approved laboratory shall conduct water quality monitoring for the facility in accordance with Chapter 62-160,FAC; (62-701.330(3)(h),FAC)
✔	Section S			7.	Provide a statement of how the applicant will demonstrate financial responsibility for the closing and long-term care of the landfill; (62-701.330(3)(i),FAC)

G. GENERAL CRITERIA FOR LANDFILLS (62-701.340,FAC)

S	LOCATION	N/A	N/C		
✔	Section G.1			1.	Describe (and show on a Federal Insurance Administration flood map, if available) how the landfill or solid waste disposal unit shall not be located in the 100-year floodplain where it will restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain unless compensating storage is provided, or result in a washout of solid waste; (62-701.340(4)(b),FAC)
✔	Section G.2			2.	Describe how the minimum horizontal separation between waste deposits in the landfill and the landfill property boundary shall be 100 feet, measured from the toe of the proposed final cover slope; (62-701.340(4)(c),FAC)
✔	Section G.3			3.	Describe what methods shall be taken to screen the landfill from public view where such screening can practically be provided; (62-701.340(4)(d),FAC)

H. LANDFILL CONSTRUCTION REQUIREMENTS (62-701.400,FAC)

S	LOCATION	N/A	N/C		
✔	Section H.1			1.	Describe how the landfill shall be designed so that solid waste disposal units will be constructed and closed at planned intervals throughout the design period of the landfill; (62-701.400(2),FAC)
				2.	Landfill liner requirements; (62-701.400(3),FAC)
				a.	General construction requirements; (62-701.400(3)(a),FAC):
✔	Section H.2.a.1			(1)	Provide test information and documentation to ensure the liner will be constructed of materials that have appropriate physical, chemical, and mechanical properties to prevent failure;
✔	Section H.2.a.2			(2)	Document foundation is adequate to prevent liner failure;
✔	Section H.2.a.3			(3)	Constructed so bottom liner will not be adversely impacted by fluctuations of the ground water;
✔	Section H.2.a.4			(4)	Designed to resist hydrostatic uplift if bottom liner located below seasonal high ground water table;
✔	Section H.2.a.5			(5)	Installed to cover all surrounding earth which could come into contact with the waste or leachate.
				b.	Composite liners; (62-701.400(3)(b),FAC)
✔	Section H.2.b.1			(1)	Upper geomembrane thickness and properties;
✔	Section H.2.b.2			(2)	Design leachate head for primary LCRS including leachate recirculation if appropriate;
✔	Section H.2.b.3			(3)	Design thickness in accordance with Table A and number of lifts planned for lower soil component.

S	LOCATION	N/A	N/C	PART H CONTINUED
				c. Double liners; (62-701.400(3)(c),FAC)
✔	Section H.2.c.1			(1) Upper and lower geomembrane thicknesses and properties;
✔	Section H.2.c.2			(2) Design leachate head for primary LCRS to limit the head to one foot above the liner;
✔	Section H.2.c.3			(3) Lower geomembrane sub-base design;
✔	Section H.2.c.4			(4) Leak detection and secondary leachate collection system minimum design criteria ($k \geq 10$ cm/sec, head on lower liner ≤ 1 inch, head not to exceed thickness of drainage layer);
				d. Standards for geosynthetic components; (62-701.400(3)(d),FAC)
✔	Section H.2.d.1			(1) Field seam test methods to ensure all field seams are at least 90 percent of the yield strength for the lining material;
✔	Section H.2.d.2			(2) Geomembranes to be used shall pass a continuous spark test by the manufacturer;
✔	Section H.2.d.3			(3) Design of 24-inch-thick protective layer above upper geomembrane liner;
✔	Section H.2.d.4			(4) Describe operational plans to protect the liner and leachate collection system when placing the first layer of waste above 24-inch-thick protective layer.
✔	Section H.2.d.5			(5) HDPE geomembranes, if used, meet the specifications in GRI GM13;
	Section H.2.d.6	✔		(6) PVC geomembranes, if used, meet the specifications in PGI 1197;
✔	Section H.2.d.7			(7) Interface shear strength testing results of the actual components which will be used in the liner system;
✔	Section H.2.d.8			(8) Transmissivity testing results of geonets if they are used in the liner system;
✔	Section H.2.d.9			(9) Hydraulic conductivity testing results of geosynthetic clay liners if they are used in the liner system;

S	LOCATION	N/A	N/C	PART H CONTINUED
				e. Geosynthetic specification requirements; (62-701.400(3)(e),FAC)
✔	Section H.2.e.1			(1) Definition and qualifications of the designer, manufacturer, installer, QA consultant and laboratory, and QA program;
✔	Section H.2.e.2			(2) Material specifications for geomembranes, geocomposites, geotextiles, geogrids, and geonets;
✔	Section H.2.e.3			(3) Manufacturing and fabrication specifications including geomembrane raw material and roll QA, fabrication personnel qualifications, seaming equipment and procedures, overlaps, trial seams, destructive and nondestructive seam testing, seam testing location, frequency, procedure, sample size and geomembrane repairs;
✔	Section H.2.e.4			(4) Geomembrane installation specifications including earthwork, conformance testing, geomembrane placement, installation personnel qualifications, field seaming and testing, overlapping and repairs, materials in contact with geomembrane and procedures for lining system acceptance;
✔	Section H.2.e.5			(5) Geotextile and geogrid specifications including handling and placement, conformance testing, seams and overlaps, repair, and placement of soil materials and any overlying materials;
✔	Section H.2.e.6			(6) Geonet and geocomposite specifications including handling and placement, conformance testing, stacking and joining, repair, and placement of soil materials and any overlying materials;
✔	Section H.2.e.7			(7) Geosynthetic clay liner specifications including handling and placement, conformance testing, seams and overlaps, repair, and placement of soil material and any overlying materials;
				f. Standards for soil components (62-710.400(3)(f),FAC):
✔	Section H.2.f.1			(1) Description of construction procedures including overexcavation and backfilling to preclude structural inconsistencies and procedures for placing and compacting soil component in layers;

S	LOCATION	N/A	N/C	PART H CONTINUED
✔	Section H.2.f.2			(2) Demonstration of compatibility of the soil component with actual or simulated leachate in accordance with EPA Test Method 9100 or an equivalent test method;
✔	Section H.2.f.3			(3) Procedures for testing in-situ soils to demonstrate they meet the specifications for soil liners;
				(4) Specifications for soil component of liner including at a minimum:
✔	Section H.2.f.4.a			(a) Allowable particle size distribution, Atterberg limits, shrinkage limit;
✔	Section H.2.f.4.b			(b) Placement moisture and dry density criteria;
✔	Section H.2.f.4.c			(c) Maximum laboratory-determined saturated hydraulic conductivity using simulated leachate;
✔	Section H.2.f.4.d			(d) Minimum thickness of soil liner;
✔	Section H.2.f.4.e			(e) Lift thickness;
✔	Section H.2.f.4.f			(f) Surface preparation (scarification);
✔	Section H.2.f.4.g			(g) Type and percentage of clay mineral within the soil component;
✔	Section H.2.f.5			(5) Procedures for constructing and using a field test section to document the desired saturated hydraulic conductivity and thickness can be achieved in the field.
				3. Leachate collection and removal system (LCRS); (62-701.400(4),FAC)
				a. The primary and secondary LCRS requirements; (62-701.400(4)(a),FAC)
✔	Section H.3.a.1			(1) Constructed of materials chemically resistant to the waste and leachate;
✔	Section H.3.a.2			(2) Have sufficient mechanical properties to prevent collapse under pressure;
✔	Section H.3.a.3			(3) Have granular material or synthetic geotextile to prevent clogging;
✔	Section H.3.a.4			(4) Have method for testing and cleaning clogged pipes or contingent designs for rerouting leachate around failed areas;

S	LOCATION	N/A	N/C	PART H CONTINUED
				b. Primary LCRS requirements; (62-701.400(4)(b),FAC)
✔	Section H.3.b.1			(1) Bottom 12 inches having hydraulic conductivity $\geq 1 \times 10^{-3}$ cm/sec;
✔	Section H.3.b.2			(2) Total thickness of 24 inches of material chemically resistant to the waste and leachate;
✔	Section H.3.b.3			(3) Bottom slope design to accomodate for predicted settlement;
✔	Section H.3.b.4			(4) Demonstration that synthetic drainage material, if used, is equivalent or better than granular material in chemical compatibility, flow under load and protection of geomembrane liner.
				4. Leachate recirculation; (62-701.400(5),FAC)
	Section H.4	✔		a. Describe general procedures for recirculating leachate;
	Section H.4	✔		b. Describe procedures for controlling leachate runoff and minimizing mixing of leachate runoff with storm water;
	Section H.4	✔		c. Describe procedures for preventing perched water conditions and gas buildup;
	Section H.4	✔		d. Describe alternate methods for leachate management when it cannot be recirculated due to weather or runoff conditions, surface seeps, wind-blown spray, or elevated levels of leachate head on the liner;
	Section H.4	✔		e. Describe methods of gas management in accordance with Rule 62-701.530, FAC;
	Section H.5	✔		f. If leachate irrigation is proposed, describe treatment methods and standards for leachate treatment prior to irrigation over final cover and provide documentation that irrigation does not contribute significantly to leachate generation.

S	LOCATION	N/A	N/C	PART H CONTINUED
				5. Leachate storage tanks and leachate surface impoundments; (62-701.400(6),FAC)
				a. Surface impoundment requirements; (62-701.400(6)(b),FAC)
	Section H.5.a	✔		(1) Documentation that the design of the bottom liner will not be adversely impacted by fluctuations of the ground water;
	Section H.5.a	✔		(2) Designed in segments to allow for inspection and repair as needed without interruption of service;
				(3) General design requirements;
	Section H.5.a	✔		(a) Double liner system consisting of an upper and lower 60-mil minimum thickness geomembrane;
	Section H.5.a	✔		(b) Leak detection and collection system with hydraulic conductivity $\geq$ 1 cm/sec;
	Section H.5.a	✔		(c) Lower geomembrane placed on subbase $\geq$ 6 inches thick with k $\leq$ 1×10^{-5} cm/sec or on an approved geosynthetic clay liner with k $\leq$ 1×10^{-7} cm/sec;
	Section H.5.a	✔		(d) Design calculation to predict potential leakage through the upper liner;
	Section H.5.a	✔		(e) Daily inspection requirements and notification and corrective action requirements if leakage rates exceed that predicted by design calculations;
	Section H.5.a.4	✔		(4) Description of procedures to prevent uplift, if applicable;
	Section H.5.a.5	✔		(5) Design calculations to demonstrate minimum two feet of freeboard will be maintained;
	Section H.5.a.6	✔		(6) Procedures for controlling disease vectors and off-site odors.

S	LOCATION	N/A	N/C	PART H CONTINUED
				b. Above-ground leachate storage tanks; (62-701.400(6)(c),FAC)
	Section H.5.b		✔	(1) Describe tank materials of construction and ensure foundation is sufficient to support tank;
	Section H.5.b		✔	(2) Describe procedures for cathodic protection if needed for the tank;
	Section H.5.b		✔	(3) Describe exterior painting and interior lining of the tank to protect it from the weather and the leachate stored;
	Section H.5.b		✔	(4) Describe secondary containment design to ensure adequate capacity will be provided and compatibility of materials of construction;
	Section H.5.b		✔	(5) Describe design to remove and dispose of stormwater from the secondary containment system;
	Section H.5.b		✔	(6) Describe an overfill prevention system such as level sensors, gauges, alarms and shutoff controls to prevent overfilling;
				(7) Inspections, corrective action and reporting requirements;
	Section H.5.b		✔	(a) Overfill prevention system weekly;
	Section H.5.b		✔	(b) Exposed tank exteriors weekly;
	Section H.5.b		✔	(c) Tank interiors when tank is drained or at least every three years;
	Section H.5.b		✔	(d) Procedures for immediate corrective action if failures detected;
	Section H.5.b		✔	(e) Inspection reports available for department review.
				c. Underground leachate storage tanks; (62-701.400(6)(d),FAC)
	Section H.5.c	✔		(1) Describe materials of construction;
	Section H.5.c	✔		(2) A double-walled tank design system to be used with the following requirements;

S	LOCATION	N/A	N/C	PART H CONTINUED
	Section H.5.c.2.a	✔		(a) Interstitial space monitoring at least weekly;
	Section H.5.c.2.b	✔		(b) Corrosion protection provided for primary tank interior and external surface of outer shell;
	Section H.5.c.2.c	✔		(c) Interior tank coatings compatible with stored leachate;
	Section H.5.c.2.d	✔		(d) Cathodic protection inspected weekly and repaired as needed;
	Section H.5.c.3	✔		(3) Describe an overfill prevention system such as level sensors, gauges, alarms and shutoff controls to prevent overfilling and provide for weekly inspections;
	Section H.5.c	✔		(4) Inspection reports available for department review.
✔	Section H.5.d			d. Schedule provided for routine maintenance of LCRS; (62-701.400(6)(e),FAC)
				6. Liner systems construction quality assurance (CQA); (62-701.400(7),FAC)
✔	Section H.6			a. Provide CQA Plan including:
✔	Section H.6			(1) Specifications and construction requirements for liner system;
✔	Section H.6			(2) Detailed description of quality control testing procedures and frequencies;
✔	Section H.6			(3) Identification of supervising professional engineer;
✔	Section H.6			(4) Identify responsibility and authority of all appropriate organizations and key personnel involved in the construction project;
✔	Section H.6			(5) State qualifications of CQA professional engineer and support personnel;
✔	Section H.6			(6) Description of CQA reporting forms and documents;

S	LOCATION	N/A	N/C	PART H CONTINUED
✔	Section H.6			b. An independent laboratory experienced in the testing of geosynthetics to perform required testing;
				7. Soil Liner CQA (62-701.400(8)FAC)
✔	Section H.7			a. Documentation that an adequate borrow source has been located with test results or description of the field exploration and laboratory testing program to define a suitable borrow source;
✔	Section H.7			b. Description of field test section construction and test methods to be implemented prior to liner installation;
✔	Section H.7			c. Description of field test methods including rejection criteria and corrective measures to insure proper liner installation.
				8. Surface water management systems; (62-701.400(9),FAC)
✔	Section H.8.a			a. Provide a copy of a Department permit for stormwater control or documentation that no such permit is required;
✔	Section H.8.b			b. Design of surface water management system to isolate surface water from waste filled areas and to control stormwater run-off;
✔	Section H.8.c			c. Details of stormwater control design including retention ponds, detention ponds, and drainage ways;
				9. Gas control systems; (62-701.400(10),FAC)
✔	Section H.9.a			a. Provide documentation that if the landfill is receiving degradable wastes, it will have a gas control system complying with the requirements of Rule 62-701.530, FAC;
✔	Section H.10			10. For landfills designed in ground water, provide documentation that the landfill will provide a degree of protection equivalent to landfills designed with bottom liners not in contact with ground water; (62-701.400(11),FAC)

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I. HYDROGEOLOGICAL INVESTIGATION REQUIREMENTS (62-701.410(1), FAC)

S	LOCATION	N/A	N/C		
				1.	Submit a hydrogeological investigation and site report including at least the following information:
✔	Section I			a.	Regional and site specific geology and hydrogeology;
✔	Section I			b.	Direction and rate of ground water and surface water flow including seasonal variations;
✔	Section I			c.	Background quality of ground water and surface water;
✔	Section I			d.	Any on-site hydraulic connections between aquifers;
✔	Section I			e.	Site stratigraphy and aquifer characteristics for confining layers, semi-confining layers, and all aquifers below the landfill site that may be affected by the landfill;
✔	Section I			f.	Description of topography, soil types and surface water drainage systems;
✔	Section I			g.	Inventory of all public and private water wells within a one-mile radius of the landfill including, where available, well top of casing and bottom elevations, name of owner, age and usage of each well, stratigraphic unit screened, well construction technique and static water level;
✔	Section I			h.	Identify and locate any existing contaminated areas on the site;
✔	Section I			i.	Include a map showing the locations of all potable wells within 500 feet, and all community water suupply wells within 1000 feet, of the waste storage and disposal areas;
✔				2.	Report signed, sealed and dated by PE or PG.

J. GEOTECHNICAL INVESTIGATION REQUIREMENTS (62-701.410(2),FAC)

S	LOCATION	N/A	N/C		
				1.	Submit a geotechnical site investigation report defining the engineering properties of the site including at least the following:
✔	Section J.1.a			a.	Description of subsurface conditions including soil stratigraphy and ground water table conditions;
✔	Section J.1.b			b.	Investigate for the presence of muck, previously filled areas, soft ground, lineaments and sink holes;
✔	Section J.1.c			c.	Estimates of average and maximum high water table across the site;
				d.	Foundation analysis including:
✔	Section J.1.d.1			(1)	Foundation bearing capacity analysis;
✔	Section J.1.d.2			(2)	Total and differential subgrade settlement analysis;
✔	Section J.1.d.3			(3)	Slope stability analysis;
✔	Section J.1.e			e.	Description of methods used in the investigation and includes soil boring logs, laboratory results, analytical calculations, cross sections, interpretations and conclusions;
✔	Section J.1.f			f.	An evaluation of fault areas, seismic impact zones, and unstable areas as described in 40 CFR 258.13, 40 CFR 258.14 and 40 CFR 258.15.
✔	Section J.2			2.	Report signed, sealed and dated by PE or PG.

K. VERTICAL EXPANSION OF LANDFILLS (62-701.430,FAC)

S	LOCATION	N/A	N/C		
✔	Section K.1			1.	Describe how the vertical expansion shall not cause or contribute to leachate leakage from the existing landfill or adversely affect the closure design of the existing landfill;
✔	Section K.2			2.	Describe how the vertical expansion over unlined landfills will meet the requirements of Rule 62-701.400, FAC with the exceptions of Rule 62-701.430(1)(c),FAC;
✔	Section K.3			3.	Provide foundation and settlement analysis for the vertical expansion;
✔	Section K.4			4.	Provide total settlement calculations demonstrating that the final elevations of the lining system, that gravity drainage, and that no other component of the design will be adversely affected;
✔	Section K.5			5.	Minimum stability safety factor of 1.5 for the lining system component interface stability and deep stability;
✔	Section K.6			6.	Provide documentation to show the surface water management system will not be adversely affected by the vertical expansion;
✔	Section K.7			7.	Provide gas control designs to prevent accumulation of gas under the new liner for the vertical expansion.

L. **LANDFILL OPERATION REQUIREMENTS** (62-701.500,FAC)

✔	Section L.1			1.		Provide documentation that landfill will have at least one trained operator during operation and at least one trained spotter at each working face; (62-701.500(1),FAC)
				2.		Provide a landfill operation plan including procedures for: (62-701.500(2), FAC)
✔	Section L.2.a				a.	Designating responsible operating and maintenance personnel;
✔	Section L.2.b				b.	Contingency operations for emergencies;
✔	Section L.2.c				c.	Controlling types of waste received at the landfill;
✔	Section L.2.d				d.	Weighing incoming waste;
✔	Section L.2.e				e.	Vehicle traffic control and unloading;
✔	Section L.2.f				f.	Method and sequence of filling waste;
✔	Section L.2.g				g.	Waste compaction and application of cover;
✔	Section L.2.h				h.	Operations of gas, leachate, and stormwater controls;
✔	Section L.2.i				i.	Water quality monitoring.
✔	Section L.2.j				j.	Maintaining and cleaning the leachate collection system;
✔	Section L.3			3.		Provide a description of the landfill operation record to be used at the landfill; details as to location of where various operational records will be kept (i.e. FDEP permit, engineering drawings, water quality records, etc.) (62-701.500(3),FAC)
✔	Section L.4			4.		Describe the waste records that will be compiled monthly and provided to the Department quarterly; (62-701.500(4),FAC)
✔	Section L.5			5.		Describe methods of access control; (62-701.500(5),FAC)
✔	Section L.6			6.		Describe load checking program to be implemented at the landfill to discourage disposal of unauthorized wastes at the landfill; (62-701.500(6),FAC)
				7.		Describe procedures for spreading and compacting waste at the landfill that include: (62-701.500(7),FAC)
✔	Section L.7.a				a.	Waste layer thickness and compaction frequencies;

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S	LOCATION	N/A	N/C	PART L CONTINUED
✔	Section L.7.b			b. Special considerations for first layer of waste placed above liner and leachate collection system;
✔	Section L.7.c			c. Slopes of cell working face and side grades above land surface, planned lift depths during operation;
✔	Section L.7.d			d. Maximum width of working face;
				e. Description of type of initial cover to be used at the facility that controls:
✔	Section L.7.e.1			(1) Disease vector breeding/animal attraction
✔	Section L.7.e.2			(2) Fires
✔	Section L.7.e.3			(3) Odors
✔	Section L.7.e.4			(4) Blowing litter
✔	Section L.7.e.5			(5) Moisture infiltration
✔	Section L.7.f			f. Procedures for applying initial cover including minimum cover frequencies;
✔	Section L.7.g			g. Procedures for applying intermediate cover;
✔	Section L.7.h			h. Time frames for applying final cover;
✔	Section L.7.i			i. Procedures for controlling scavenging and salvaging.
✔	Section L.7.j			j. Description of litter policing methods;
✔	Section L.7.k			k. Erosion control procedures.
				8. Describe operational procedures for leachate management including; (62-701.500(8),FAC)
✔	Section L.8.a			a. Leachate level monitoring, sampling, analysis and data results submitted to the Department;
✔	Section L.8.b			b. Operation and maintenance of leachate collection and removal system, and treatment as required;
✔	Section L.8.c			c. Procedures for managing leachate if it becomes regulated as a hazardous waste;
✔	Section L.8.d			d. Agreements for off-site discharge and treatment of leachate;
✔	Section L.8.e			e. Contingency plan for managing leachate during emergencies or equipment problems;

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S	LOCATION	N/A	N/C	PART L CONTINUED
✔	Section L.8.f			f. Procedures for recording quantities of leachate generated in gal/day and including this in the operating record;
✔	Section L.8.g			g. Procedures for comparing precipitation experienced at the landfill with leachate generation rates and including this information in the operating record;
✔	Section L.8.h			h. Procedures for water pressure cleaning or video inspecting leachate collection systems.
✔	Section L.9			9. Describe how the landfill receiving degradable wastes shall implement a gas management system meeting the requirements of Rule 62-701.530, FAC; (62-701.500(9),FAC)
✔	Section L.10			10. Describe procedures for operating and maintaining the landfill stormwater management system to comply with the requirements of Rule 62-701.400(9); (62-701.500(10),FAC)
				11. Equipment and operation feature requirements; (62-701.500(11),FAC)
✔	Section L.11.a			a. Sufficient equipment for excavating, spreading, compacting and covering waste;
✔	Section L.11.b			b. Reserve equipment or arrangements to obtain additional equipment within 24 hours of breakdown;
✔	Section L.11.c			c. Communications equipment;
✔	Section L.11.d			d. Dust control methods;
✔	Section L.11.e			e. Fire protection capabilities and procedures for notifying local fire department authorities in emergencies;
✔	Section L.11.f			f. Litter control devices;
✔	Section L.11.g			g. Signs indicating operating authority, traffic flow, hours of operation, disposal restrictions.
✔	Section L.12			12. Provide a description of all-weather access road, inside perimeter road and other roads necessary for access which shall be provided at the landfill; (62-701.500(12),FAC)
✔	Section L.13			13. Additional record keeping and reporting requirements; (62-701.500(13),FAC)

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S	LOCATION	N/A	N/C		PART L CONTINUED
✔	Section L.13.a			a.	Records used for developing permit applications and supplemental information maintained for the design period of the landfill;
✔	Section L.13.b			b.	Monitoring information, calibration and maintenance records, copies of reports required by permit maintained for at least 10 years;
✔	Section L.13.c			c.	Maintain annual estimates of the remaining life of constructed landfills and of other permitted areas not yet constructed and submit this estimate annually to the Department;
✔	Section L.13.d			d.	Procedures for archiving and retrieving records which are more than five year old.

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M. WATER QUALITY AND LEACHATE MONITORING REQUIREMENTS (62-701.510, FAC)

S	LOCATION	N/A	N/C		
✔	Attachment M-1			1.	Water quality and leachate monitoring plan shall be submitted describing the proposed ground water, surface water and leachate monitoring systems and shall meet at least the following requirements;
✔	Attachment M-1			a.	Based on the information obtained in the hydrogeological investigation and signed, dated and sealed by the PG or PE who prepared it; (62-701.510(2)(a),FAC)
✔	Attachment M-1			b.	All sampling and analysis preformed in accordance with Chapter 62-160, FAC; (62-701.510(2)(b),FAC)
				c.	Ground water monitoring requirements; (62-701.510(3),FAC)
✔	Attachment M-1			(1)	Detection wells located downgradient from and within 50 feet of disposal units;
✔	Attachment M-1			(2)	Downgradient compliance wells as required;
✔	Attachment M-1			(3)	Background wells screened in all aquifers below the landfill that may be affected by the landfill;
✔	Attachment M-1			(4)	Location information for each monitoring well;
✔	Attachment M-1			(5)	Well spacing no greater than 500 feet apart for downgradient wells and no greater than 1500 feet apart for upgradient wells unless site specific conditions justify alternate well spacings;
✔	Attachment M-1			(6)	Well screen locations properly selected;
✔	Attachment M-1			(7)	Procedures for properly abandoning monitoring wells;
	Attachment M-1	✔		(8)	Detailed description of detection sensors if proposed.

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S	LOCATION	N/A	N/C	PART M CONTINUED
				d. Surface water monitoring requirements; (62-701.510(4),FAC)
✔	Attachment M-1			(1) Location of and justification for all proposed surface water monitoring points;
✔	Attachment M-1			(2) Each monitoring location to be marked and its position determined by a registered Florida land surveyor;
✔	Attachment M-1			e. Leachate sampling locations proposed; (62-701.510(5),FAC)
				f. Initial and routine sampling frequency and requirements; (62-701.510(6),FAC)
✔	Attachment M-1			(1) Initial background ground water and surface water sampling and analysis requirements;
✔	Attachment M-1			(2) Routine leachate sampling and analysis requirements;
✔	Attachment M-1			(3) Routine monitoring well sampling and analysis requirements;
✔	Attachment M-1			(4) Routine surface water sampling and analysis requirements.
✔	Attachment M-1			g. Describe procedures for implementing evaluation monitoring, prevention measures and corrective action as required; (62-701.510(7),FAC)
✔	Attachment M-1			h. Water quality monitoring report requirements; (62-701.510(9),FAC)
✔	Attachment M-1			(1) Semi-annual report requirements;
✔	Attachment M-1			(2) Bi-annual report requirements signed, dated and sealed by PG or PE.

N. SPECIAL WASTE HANDLING REQUIREMENTS (62-701.520, FAC)

S	LOCATION	N/A	N/C		
		✔		1.	Describe procedures for managing motor vehicles; (62-701.520(1),FAC)
		✔		2.	Describe procedures for landfilling shredded waste; (62-701.520(2),FAC)
✔	Section N.3			3.	Describe procedures for asbestos waste disposal; (62-701.520(3),FAC)
✔	Section N.4			4.	Describe procedures for disposal or management of contaminated soil; (62-701.520(4), FAC)
		✔		5.	Describe procedures for disposal of biological wastes; (62-701.520(5), FAC)

O. GAS MANAGEMENT SYSTEM REQUIREMENTS (62-701.530,FAC)

S	LOCATION	N/A	N/C		
				1.	Provide the design for a gas management systems that will (62-701.530(1), FAC):
✔	Section O			a.	Be designed to prevent concentrations of combustible gases from exceeding 25% the LEL in structures and 100% the LEL at the property boundary;
✔	Section O			b.	Be designed for site-specific conditions;
✔	Section O			c.	Be designed to reduce gas pressure in the interior of the landfill;
✔	Section O			d.	Be designed to not interfere with the liner, leachate control system or final cover.
✔	Section O			2.	Provide documentation that will describe locations, construction details and procedures for monitoring gas at ambient monitoring points and with soil monitoring probes; (62-701.530(2), FAC):
✔	Section O			3.	Provide documentation describing how the gas remediation plan and odor remediation plan will be implemented; (62-701.530(3), FAC):
				4.	Landfill gas recovery facilities; (62-701.530(5), FAC):
✔	Section O			a.	Information required in Rules 62-701.320(7) and 62-701.330(3), FAC supplied;
✔	Section O			b.	Information required in Rule 62-701.600(4), FAC supplied where relevant and practical;
✔	Section O			c.	Estimate of current and expected gas generation rates and description of condensate disposal methods provided;
		✔		d.	Description of procedures for condensate sampling, analyzing and data reporting provided;

		✔		e.	Closure plan provided describing methods to control gas after recovery facility ceases operation and any other requirements contained in Rule 62-701.400(10), FAC;
		✔		f.	Performance bond provided to cover closure costs if not already included in other landfill closure costs.

P. LANDFILL FINAL CLOSURE REQUIREMENTS (62-701.600,FAC)

1. Closure schedule requirements; (62-701.600(2),FAC)

✔	Section P.1			a.	Documentation that a written notice including a schedule for closure will be provided to the Department at least one year prior to final receipt of wastes;
✔	Section P.1			b.	Notice to user requirements within 120 days of final receipt of wastes;
✔	Section P.1			c.	Notice to public requirements within 10 days of final receipt of wastes.

2. Closure permit general requirements; (62-701.600(3),FAC)

		✔		a.	Application submitted to Department at least 90 days prior to final receipt of wastes;
				b.	Closure plan shall include the following:
		✔		(1)	Closure report;
		✔		(2)	Closure design plan;
		✔		(3)	Closure operation plan;
		✔		(4)	Closure procedures;
		✔		(5)	Plan for long term care;
		✔		(6)	A demonstration that proof of financial responsibility for long term care will be provided.

3. Closure report requirements; (62-701.600(4),FAC)

a. General information requirements;

		✔		(1)	Identification of landfill;

S	LOCATION	N/A	N/C	PART P CONTINUED
		✔		(2) Location, description and vicinity map;
		✔		(3) Total acres of disposal areas and landfill property;
		✔		(4) Legal property description;
		✔		(5) History of landfill;
		✔		(6) Identification of types of waste disposed of at the landfill.
		✔		b. Geotechnical investigation report and water quality monitoring plan required by Rule 62-701.330(3),FAC;
		✔		c. Land use information report indicating: identification of adjacent landowners; zoning; present land uses; and roads, highways right-of-way, or easements.
		✔		d. Report on actual or potential gas migration at landfills containing degradable wastes which would allow migration of gas off the landfill property;
		✔		e. Report assessing the effectiveness of the landfill design and operation including results of geotechnical investigations, surface water and storm water management, gas migration and concentrations, condition of existing cover, and nature of waste disposed of at the landfill;
				4. Closure design requirements to be included in the closure design plan: (62-701.600(5),FAC)
		✔		a. Plan sheet showing phases of site closing;
		✔		b. Drawings showing existing topography and proposed final grades;
		✔		c. Provisions to close units when they reach approved design dimensions;
		✔		d. Final elevations before settlement;
		✔		e. Side slope design including benches, terraces, down slope drainage ways, energy dissipators and discussion of expected precipitation effects;
				f. Final cover installation plans including:
		✔		(1) CQA plan for installing and testing final cover;

S	LOCATION	N/A	N/C	PART P CONTINUED
		✔		(2) Schedule for installing final cover after final receipt of waste;
		✔		(3) Description of drought-resistant species to be used in the vegetative cover;
		✔		(4) Top gradient design to maximize runoff and minimize erosion;
		✔		(5) Provisions for cover material to be used for final cover maintenance.
				g. Final cover design requirements:
		✔		(1) Protective soil layer design;
		✔		(2) Barrier soil layer design;
		✔		(3) Erosion control vegetation;
		✔		(4) Geomembrane barrier layer design;
		✔		(5) Geosynthetic clay liner design if used;
		✔		(6) Stability analysis of the cover system and the disposed waste.
		✔		h. Proposed method of stormwater control;
		✔		i. Proposed method of access control;
		✔		j. Description of proposed final use of the closed landfill, if any;
		✔		k. Description of the proposed or existing gas management system which complies with Rule 62-701.530, FAC.
				5. Closure operation plan shall include: (62-701.600(6),FAC)
		✔		a. Detailed description of actions which will be taken to close the landfill;
		✔		b. Time schedule for completion of closing and long term care;
		✔		c. Describe proposed method for demonstrating financial responsibility;
		✔		d. Indicate any additional equipment and personnel needed to complete closure.

S	LOCATION	N/A	N/C
		✔	
		✔	
		✔	

PART P CONTINUED

e. Development and implementation of the water quality monitoring plan required in Rule 62-701.510, FAC.

f. Development and implementation of gas management system required in Rule 62-701.530, FAC.

6. Justification for and detailed description of procedures to be followed for temporary closure of the landfill, if desired; (62-701.600(7),FAC)

Q. CLOSURE PROCEDURES (62-701.610,FAC)

S	LOCATION	N/A	N/C		
		✔		1.	Survey monuments; (62-701.610(2),FAC)
		✔		2.	Final survey report; (62-701.610(3),FAC)
		✔		3.	Certification of closure construction completion; (62-701.610(4),FAC)
		✔		4.	Declaration to the public; (62-701.610(5),FAC)
		✔		5.	Official date of closing; (62-701.610(6),FAC)
		✔		6.	Use of closed landfill areas; (62-701.610(7),FAC)
		✔		7.	Relocation of wastes; (62-701.610(8), FAC)

R. LONG TERM CARE REQUIREMENTS (62-701.620,FAC)

S	LOCATION	N/A	N/C		
✔	Section R			1.	Maintaining the gas collection and monitoring system; (62-701.620(5), FAC)
✔	Section R			2.	Right of property access requirements; (62-701.620(6),FAC)
✔	Section R			3.	Successors of interest requirements; (62-701.620(7),FAC)
✔	Section R			4.	Requirements for replacement of monitoring devices; (62-701.620(9),FAC)
✔	Section R			5.	Completion of long term care signed and sealed by professional engineer (62-701.620(10), FAC).

S. FINANCIAL RESPONSIBILITY REQUIREMENTS (62-701.630,FAC)

S	LOCATION	N/A	N/C		
✔	Section S			1.	Provide cost estimates for closing, long term care, and corrective action costs estimated by a PE for a third party performing the work, on a per unit basis, with the source of estimates indicated; (62-701.630(3)&(7), FAC).
✔	Section S			2.	Describe procedures for providing annual cost adjustments to the Department based on inflation and changes in the closing, long-term care, and corrective action plans; (62-701.630(4)&(8), FAC).
✔	Section S			3.	Describe funding mechanisms for providing proof of financial assurance and include appropriate financial assurance forms; (62-701.630(5),(6),&(9), FAC).

T. CERTIFICATION BY APPLICANT AND ENGINEER OR PUBLIC OFFICER

1. Applicant:

The undersigned applicant or authorized representative of Hardee County Solid Waste Department is aware that statements made in this form and attached information are an application for a Construction Permit from the Florida Department of Environmental Protection and certifies that the information in this application is true, correct and complete to the best of his/her knowledge and belief. Further, the undersigned agrees to comply with the provisions of Chapter 403, Florida Statutes, and all rules and regulations of the Department. It is understood that the Permit is not transferable, and the Department will be notified prior to the sale or legal transfer of the permitted facility.

Janice Williamson	685 Airport Road
Signature of Applicant or Agent	Mailing Address
Janice Williamson, Solid Waste Director	Wauchula, FL 33873
Name and Title (please type)	City, State, Zip Code
Janice.Williamson@Hardeecounty.net	(863) 773-5089
E-Mail address (if available)	Telephone Number
	Date:

Attach letter of authorization if agent is not a governmental official, owner, or corporate officer.

2. Professional Engineer registered in Florida (or Public Officer if authorized under Sections 403.707 and 403.7075, Florida Statutes):

This is to certify that the engineering features of this solid waste management facility have been designed/examined by me and found to conform to engineering principles applicable to such facilities. In my professional judgment, this facility, when properly maintained and operated, will comply with all applicable statutes of the State of Florida and rules of the Department. It is agreed that the undersigned will provide the applicant with a set of instructions of proper maintenance and operation of the facility.

April 5, 2004	SCS Engineers, 3012 U.S. Hwy 301 N., Suite 700
Signature	Mailing Address
Joseph H. O'Neill, Project Manager	Tampa, FL 33619
Name and Title (please type)	City, State, Zip Code
	joneill@scsengineers.com
	E-Mail address (if available)
052049	(813) 621-0080
Florida Registration Number (please affix seal)	Telephone Number
	Date: ~~March 31, 2004~~ JHO April 5, 2004

DEP FORM 62-701.900(1)
Effective 05-27-01

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CONSTRUCTION PERMIT APPLICATION
FOR
HARDEE COUNTY LANDFILL EXPANSION

VOLUME 1 OF 2

Prepared for:

Hardee County
Board of County Commissioners
412 West Orange Street
Wauchula, Florida
863-773-5089

Prepared by:

SCS Engineers
3012 U.S. Highway 301 North, Suite 700
Tampa, Florida 33619
(813) 621-0080

SCS Engineers
Florida Certificate of Authorization No. 00004892

File No. 09199033.09
April 2004

VOLUME 1 OF 2

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VOLUME 1 OF 2
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TABLES

ATTACHMENTS

SECTION A

GENERAL INFORMATION

Hardee County (County) owns and operates the Hardee County Landfill under Florida Department of Environmental Protection (FDEP) Permit Number 38414-002-SO, modification 38414-006). The landfill is located on Airport Road, approximately one mile north of State Road 636, in Wauchula, Florida. The site location is shown in Attachment A-1, Figure A-1. The facility serves Hardee County. This application is for the expansion of the existing Class I landfill. The proposed activity involves construction of the first section of a lined expansion to the west and south of the existing landfill.

This permit application has been prepared in accordance with applicable sections of Rule 62-701, FAC, and provides the required facility information for agency review and approval. Required information that has previously been submitted and is applicable to this construction permit has not been resubmitted. These portions of the application not resubmitted have been marked "No Substantial Change" on the application form.

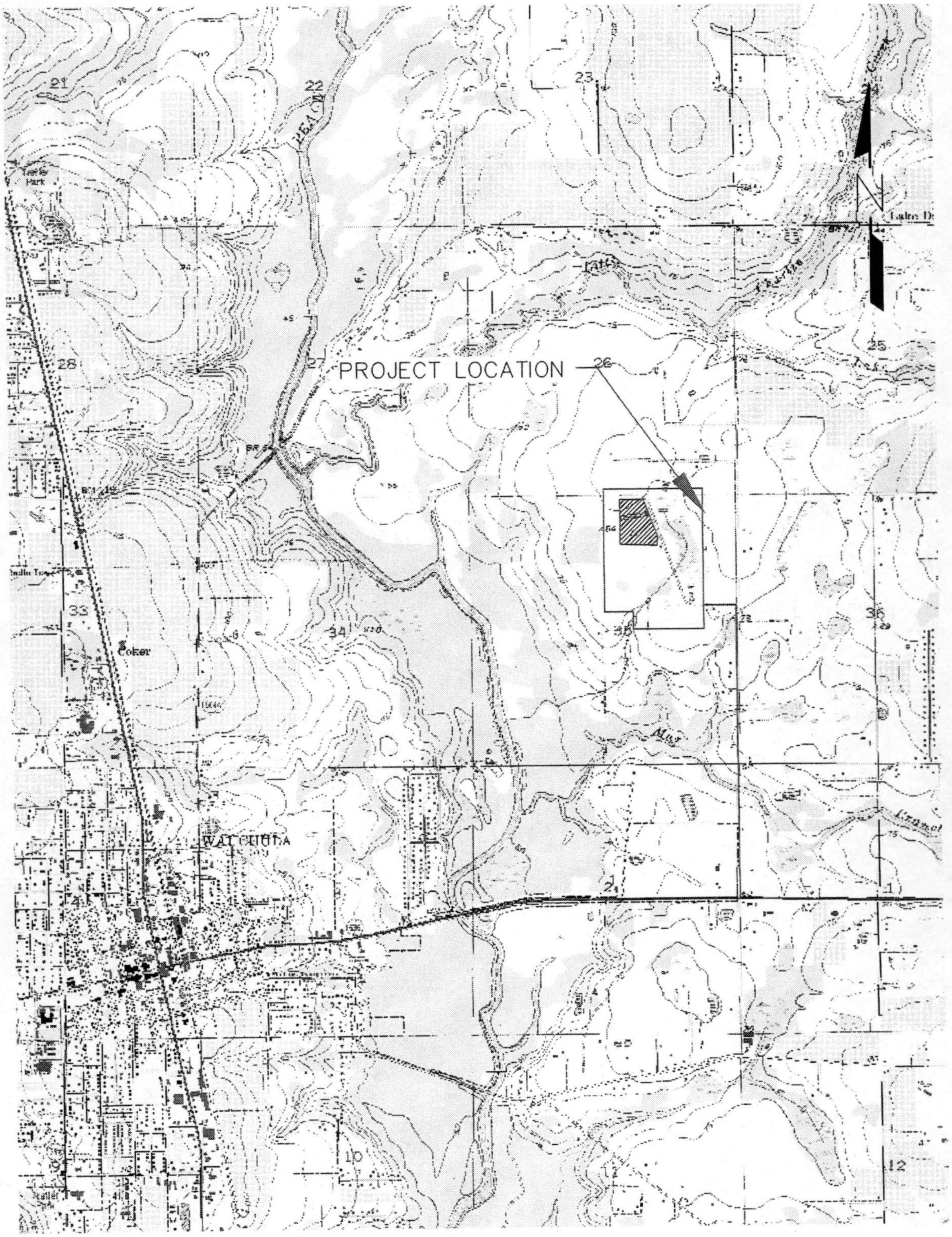
This application is for the construction permit for Hardee County's Class I Landfill expansion. The Hardee County Landfill facility includes the following components:

- Operation of the Class I Landfill
- Operation of a Household Hazardous Waste Collection Facility
- Operation of a Scrap Metal/White Goods Collection Facility

The information required for Part A of the permit application is included on the application form.

ATTACHMENT A-1

SITE LOCATION



SCALE: 1" = 3000'

SOURCE: WAUCHULA USGS QUADRANGLE MAP, 1955, Photo Revised 1987

SECTION: 35 TOWNSHIP: 33S RANGE: 25E
SECTION: 26 TOWNSHIP: 33S RANGE: 25E

SCS ENGINEERS

G:\PROJECT\09199033.09\figures\093309USGS.dwg Oct 28, 2003 - 11:10am By: 2226lie

Figure A-1 Site Location Map Hardee County Landfill
Hardee County, Florida

SECTION B

DISPOSAL FACILITY GENERAL INFORMATION

The required information for Part B of the permit application is included on the application form, which is attached at the beginning of this permit application report.

SECTION C

NON-DISPOSAL FACILITY GENERAL INFORMATION

Part C of the permit application does not apply to this construction permit and is designated as "Not Applicable" on the application form.

SECTION D

PROHIBITIONS

D.1 SITING

The existing landfill has been permitted under the siting criteria of Rule 62-701.300(2), FAC. The expanded landfill limits also fulfill the siting criteria as follows:

- Rule 62-701.300(2)(a), FAC: The underlying geologic formations are adequate to support the landfill. See Section J of this document for an explanation of the underlying strata.

- Rule 62-701.300(2)(b), FAC: A potable water well is defined under Rule 62-701.200(93), FAC as any excavation that is drilled or bored, or converted from a non-potable water use, when the intended use of such excavation is for the location and acquisition of groundwater which supplies water for human consumption. A supply well is located within the fenced area of the maintenance facility; this well is not used for human consumption. This application is proposing to abandon this supply well, see Section M for details.

- Rule 62-701.300(2)(c), FAC: The expanded landfill limits are not located in a dewatered pit.

- Rule 62-701.300(2)(d), FAC: The expanded landfill limits are not located in an area with frequent and periodic flooding. A flood insurance rate map is located in Attachment G-1.

- Rule 62-701.300(2)(e), FAC: See Section J of this document for an explanation of the liner system in relation to the groundwater table. The proposed landfill expansion has the liner system periodically in the groundwater table. Design features have been included to prevent adverse impact to the liner system per rule 62-701.400(3)(a)(3), FAC.

- Rule 62-701.300(2)(f), FAC: The expanded landfill limits are not within the 200-foot setback of natural or artificial bodies of water.

- Rule 62-701.300(2)(g), FAC: The proposed landfill footprint is not located on a right of way of any public highway, road, or alley.

- Rule 62-701.300(2)(h), FAC: A community water supply is defined under Rule 62-550.200(12), FAC as a public water system that serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents. There are no community water supply wells located within 1000 feet of the proposed landfill limits.

D.2 EXEMPTIONS

There are five general exemptions contained in Rules 62-701.300(12) through (16), FAC.

Rule 62-701.300 (12)

Per Rule 62-701.300(12), the Yard Trash Processing Area, as shown on Sheet 3 of the Operations Drawings, is;

- 100 feet from an off-site potable water well.

  a. There are no known potable water wells within 100 feet of the processing area.

- 50 feet from a water body.

  b. The processing area is separated from the wetland limits by a 50 foot offset and a 20 foot perimeter road.

- 200 feet from a well serving a community water supply.

  c. Per FDEP drinking water definitions a Community water systems – means a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

  ∴ There are no community water supply wells within 200 feet of the processing area.

The facility is therefore in compliance with Rule 62-701.300(12).

62-701.300 FAC (13) applies to tanks and offsets from wells..

The water well, located immediately south of the maintenance building, only provides water to the four water hydrants located on the eastside of the landfill. The water is used for fire protection and dust control.

Per solid waste regulation in-place at the time the well behind the maintenance building was installed, specifically Rule 17-701.040(2)(c) F.A.C., the well is not a shallow well and therefore can be within 500 feet of the waste.

The following offsets are applicable for the permit application;

a) Tanks are to be offset 500 from community water systems.

Per the following FDEP drinking water definitions;

- Community water systems – means a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

- Non-Transient Non-Community water system – means a public water system that is not a community water system and that regularly serves at least 25 of the same persons over 6 months per year.

The water well, located immediately south of the maintenance building, does not serve employees or personnel at the facility therefore the facility is in compliance with Rule 62-701.300(12),

b) Tanks are to be offset 100 feet from other potable wells.

The primary containment tanks on the leachate storage tanks are located 100 feet to the west of the well located immediately south of the maintenance building. The tanks were permitted and constructed after the installation of the well (well installation occurred in 1983, refer to SWFWMD Well Construction Permit No. 384468-20). The well was identified on the PBS&J Drawings, specifically Sheet C-2, dated April 1998. The PBS&J Drawing were for the construction of the tanks.

The well is only used for supplying water to the four water hydrants located on the eastside of the landfill.

The facility is therefore in compliance with Rule 62-701.300(13).

<u>62-701.300 (14) FAC applies to waste stored indoors.</u>

This provision does not apply to this permit application; waste is not stored indoors.

<u>62-701.300 (15) FAC applies to storage in vehicles.</u>

The County does not store waste in vehicles.

<u>Rule 62-701.300 (16) FAC relates to existing facilities.</u>

The landfill was permitted prior to May 27, 2001, and remains subject to the prohibitions that were in effect at the time the construction permit were issued.

D.3 BURNING

The County does not burn waste at the landfill. The County takes active steps to prevent the burning of waste, including load inspections and stockpiling cover soil to smother any fire that might break out in the in-place waste.

D.4 HAZARDOUS WASTE

Hazardous waste is not accepted for disposal in the Class I landfill cell.

D.5 PCB DISPOSAL

PCB's are not accepted for disposal in the Class I landfill cell.

D.6 BIOMEDICAL WASTE

Biomedical wastes are not accepted for disposal within the Class I landfill cell. The Hardee County Landfill has a Household Sharps Collection Program (permitted through the Florida Department of Health; Permit No. 25-64-00334), which allows citizens to deliver their biomedical waste products (needles) in approved sharps containers to the landfill. The sharps containers are collected and stored in a locked room at the Animal Control Facility located at the landfill. The sharps containers are then transported offsite, to the Hardee County Fire and Rescue Department where a private waste hauler disposes them in an approved facility.

D.7 CLASS I SURFACE WATERS

There are no Class I surface waters within 3000 feet of the landfill cell.

D.8 SPECIAL WASTE

Special wastes include lead-acid batteries, used oil, yard trash, white goods, and whole waste tires. These wastes are not accepted for disposal in the Class I cell.

D.9 WASTE-TO-ENERGY FACILITIES RESTRICTIONS

These restrictions do not apply to this project.

D.10 LIQUIDS

Bulk liquids and non-containerized liquids are not accepted for disposal in the Class I cell.

D.11 USED OIL

Used oil, either commingled or mixed with solid waste, will not be accepted for disposal in the Class I landfill. Used oil will also not be directly disposed in the Class I landfill. Only oily wastes, sorbents, or other materials used for maintenance or to clean up or contain leaks, spills, or accidental releases of oil may be disposed of in the Class I landfill.

Used oil, generated by residents only, is collected and stored in containers in the Household Hazardous Waste Center. The used oil is collected by a private waste disposal service for proper offsite recycling.

SECTION E

SOLID WASTE MANAGEMENT FACILITY PERMIT REQUIREMENTS, GENERAL

E.1 PERMIT APPLICATION COPIES

Four copies of the completed Permit Application form, including all supporting data, are submitted to FDEP for approval.

E.2 CERTIFICATIONS

The appropriate professional certifications are provided on the application packages submitted to FDEP.

E.3 TRANSMITTAL LETTER

The transmittal letter is included in the front of this permit application report.

E.4 PERMIT APPLICATION FORM

The completed application form, dated and signed is included in this permit application report.

E.5 PERMIT APPLICATION FEE

In accordance with Rule 62-701.315(1)(a), FAC, an application fee of $10,000 is required for a construction permit. Pursuant to Florida State Law 94-278, Hardee County requests a permit fee reduction to be granted on the basis of fiscal hardship. Therefore, a check in the amount of $100 is included with this permit application package. See Attachment E-1 for certification of fiscal hardship.

E.6 ENGINEERING REPORT

The information requested on the application form, which is applicable to this construction permit, have been discussed herein or included as attachments to subsequent sections of text in this report.

E.7 OPERATION PLAN AND CLOSURE PLAN

The Operation Plan is discussed in Section L of this report. The Closure Plan is discussed in Section P of this report.

E.8 CONTINGENCY PLAN

The Contingency Plan is discussed in Section L of this report.

E.9 SOLID WASTE MANAGEMENT FACILITY PLANS

E.9.a Regional Map

A regional map is contained in Attachment E-2, Figure E-1 and shown on the Cover Sheet of the permit drawings. The regional map shows the project location and the area surrounding the Hardee County Landfill.

E.9.b Vicinity Map/Aerial Photograph

An aerial photograph, flown by I. F. Rooks and Associates in March of 2003, is included as Sheet 2 of the permit drawings. A one-mile radius from the property limits of the landfill, showing land use and zoning is shown on Sheet 2 of the permit drawings.

E.9.c Site Plan

Sheet 3 of the permit drawings depicts the current limits of the property owned by Hardee County to be used by the Hardee County Solid Waste Department. Additional property, a parcel approximately 250 feet to the west of the landfill and a parcel approximately 100 feet to the north of the landfill, was acquired by the County to provide buffer zones and allow possible expansion of the disposal area. The property deeds and titles for the new parcels, and a boundary survey of the new parcels, conducted by Chastain Skillman Incorporated, is contained in Attachment E-3. The property boundaries for the original landfill facility remain unchanged from previous permit applications.

E.9.d Details

Engineering details necessary for this construction permit are shown in the permit drawings submitted with this permit application.

E.10 PROOF OF PROPERTY OWNERSHIP

Hardee County owns the Hardee County Landfill site. As described in Section E.9.c, the landfill facility comprises of three separate parcels of land. Copies of the deeds are included in Attachment E-3.

E.11 RECYCLING ACTIVITIES

The Hardee County Landfill is a bale fill-type landfill. Wastes are baled at the on-site Materials Recovery Facility (MRF). The MRF allows the Solid Waste Department to provide the County with a waste reduction method for the Class I landfill by segregating recyclables from the non-recyclable wastes and then baling the non-recyclable waste. Furthermore, residents of Hardee County are asked to segregate recyclables prior to collection. These wastes are also segregated from non-recyclables at the MRF.

Yard trash is not disposed in the disposal area of the Landfill. Yard trash, as defined by FDEP, is "vegetative matter resulting from landscaping maintenance or land clearing operations". Yard trash is diverted from the incoming waste stream and placed in the Yard Waste Processing Area. The processed yard waste is used for erosion control at the Landfill. Processed yard waste is available for public re-use.

E.12 HISTORY OF DEPARTMENT ENFORCEMENT ACTIVITIES

The County received a Warning Letter (#WL94-0011SW25SWD) on July 22, 1994 due to a violation of Rule 62-701.500(7)(e), specifically:

> "Inadequate daily cover was observed on the MSW bale working face. Plastic tarps are being used but they only partially cover the bales. It appears that cover material is being placed on top of these tarps."

This operational error was corrected and the applicable civil penalties were settled through the performance of an in-kind project. The case was officially closed on February 13, 1995.

Since that time, there have been no other enforcement actions taken against the Hardee County Landfill.

E.13 PROOF OF PUBLICATION OF NOTICE OF APPLICATION

Notice of application for construction of the Hardee County Landfill expansion will be published in the Herald Advocate, a local newspaper of general circulation in Hardee County in accordance with Rule 62-701.320(8), FAC. The required proof of publication will be forwarded upon receipt to be included in Attachment E-4.

E.14 AIRPORT SAFETY REQUIREMENTS

Based on project files and the County's knowledge of the area, there are no licensed and operating airport runways within a five-mile radius of the landfill site. In order to confirm this, letters were sent to the Florida Department of Transportation (FDOT) requesting the location of any airport runways the vicinity of the landfill. The response letter from the FDOT is included in Attachment E-5.

E.15 OPERATOR TRAINING REQUIREMENTS

In accordance with Rule 62-701.320(15), FAC, key supervisory staff have received Landfill Operator Certification Training. Operator training certificates and hours completed are located in Appendix C of Section L within this application report.

As required by Rule 62-701.320(15), FAC, a State-certified Landfill Operator will be on site when waste is received for disposal and a trained spotter will be on site during all times when waste is deposited at the landfill working face to detect any unauthorized wastes. In addition, the equipment operators have sufficient training and knowledge to move waste and soil, and to develop the site in accordance with the design and operational standards described in this application.

The trained operators and spotters are as follows:

- Solid Waste Director - Janice Williamson
- Executive Assistant - Teresa Carver
- MRF Operator - Jerry Hutto
- MRF Operator - Ed Pearce
- MRF Operator - Moises Serrano
- Heavy Equipment Operator, Spotter - Donald Albritton
- Heavy Equipment Operator, Spotter - Steve Strickland
- Leachate Tanker Driver - Stephen Wingo
- Weighmaster - Joe Roman
- Weighmaster - Brandie Steiner

Operator training includes a 24-hour course and 16 hours of continuing education every three years. Spotter training includes an 8-hour course and 4 hours of continuing education every three years. Operator and Spotter training courses will be attended as offered by the University of Florida Center for Training, Research and Education for Environmental Occupations (TREEO) and through other FDEP approved sources. A listing of TREEO training courses and schedule is available at www.treeo.ufl.edu and as presented in Appendix C of Attachment L.

ATTACHMENT E-1

FISCAL HARDSHIP

HARDEE COUNTY
BOARD OF COUNTY COMMISSIONERS
412 W. Orange Street, Room 103
Wauchula, Florida 33873
(863)773-9430 * (863)773-6952 * Fax (863)773-0958
bcc@hardeecounty.net www.hardeecounty.net

March 18, 2004

Florida Dept. of Environmental Protection
3804 Coconut Palm Drive
Tampa, FL 33619

Re: Permit Fee Reduction

To Whom It May Concern:

Pursuant to Florida Statutes, Chapter 218.075, Hardee County is eligible for a permit fee reduction.

Hardee County is currently at 8.75 mills and Florida Law states that millage greater than eight mills would justify a permit fee reduction or waiver to be granted on the basis of hardship. Hardee County certifies that the cost of the permit processing fee is a fiscal hardship due to the fact that ad valorem operating millage is greater than eight mills.

Sincerely,

Lexton H. Albritton, Jr.

Lexton H. Albritton, Jr.
County Manager

LHA/sd

permit fee reduction 2004 county manager

William R. Lambert, Jr. – Gordon R. Norris
Clifton N. Timmerman - Bobby Ray Smith - Walter B. Olliff, Jr.
County Manager Lexton H. Albritton, Jr. — County Attorney Ken Evers

"An Equal Opportunity Employer"

RESOLUTION NO. 03-37

A RESOLUTION ADOPTING THE FINAL MILLAGE RATE FOR THE HARDEE COUNTY BOARD OF COUNTY COMMISSIONERS FOR FISCAL YEAR COMMENCING ON OCTOBER 1, 2003 AND ENDING SEPTEMBER 30, 2004; PROVIDING FOR AN EFFECTIVE DATE.

WHEREAS, the Board of County Commissioners of Hardee County, Florida held a public hearing to adopt the final millage rate for Fiscal Year 2003/2004 as required by Florida Statute 200.065; and

WHEREAS, the value of real property not exempt from taxation within Hardee County has been certified by the County Property Appraiser to the Board of County Commissioners as **$1,288,197,000**.

NOW, THEREFORE BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF HARDEE COUNTY THAT:

1. The Governing Board does hereby adopt its final millage rate of 8.75 mills to be levied for the General Fund and the Fine and Forfeiture Fund upon all real and tangible personal property located within the boundaries of the above named taxing authority.

2. **THE FINAL LEVY OF 8.75 MILLS WILL RESULT IN A 31.63% PERCENT INCREASE OVER THE ROLLED BACK RATE OF 6.647 MILLS.**

3. This final millage rate of 8.75 mills for the General Fund and Fine and Forfeiture Fund is for the calendar year 2003 to fund the expenses for the fiscal year commencing October 1, 2003 and ending September 30, 2004.

4. This resolution shall take effect immediately upon its adoption.

DULY ADOPTED AT A PUBLIC HEARING THIS 16TH DAY OF SEPTEMBER, 2003.

WILLIAM R. LAMBERT, JR., CHAIRMAN

CLIFTON N. TIMMERMAN

GORDON R. NORRIS

BOBBY RAY SMITH

WALTER B. OLLIFF, JR.

ATTEST:

B. Hugh Bradley

B. HUGH BRADLEY 9/19/2003

EX-OFFICIO CLERK TO THE BOARD

Select Year: 2003 Go

The 2003 Florida Statutes

Title XIV TAXATION AND FINANCE	Chapter 218 FINANCIAL MATTERS PERTAINING TO POLITICAL SUBDIVISIONS	View Entire Chapter

218.075 **Reduction or waiver of permit processing fees.**--Notwithstanding any other provision of law, the Department of Environmental Protection and the water management districts shall reduce or waive permit processing fees for counties with a population of 50,000 or less on April 1, 1994, until such counties exceed a population of 75,000 and municipalities with a population of 25,000 or less, or any county or municipality not included within a metropolitan statistical area. Fee reductions or waivers shall be approved on the basis of fiscal hardship or environmental need for a particular project or activity. The governing body must certify that the cost of the permit processing fee is a fiscal hardship due to one of the following factors:

(1) Per capita taxable value is less than the statewide average for the current fiscal year;

(2) Percentage of assessed property value that is exempt from ad valorem taxation is higher than the statewide average for the current fiscal year;

(3) Any condition specified in s. 218.503, that determines a state of financial emergency;

(4) Ad valorem operating millage rate for the current fiscal year is greater than 8 mills; or

(5) A financial condition that is documented in annual financial statements at the end of the current fiscal year and indicates an inability to pay the permit processing fee during that fiscal year.

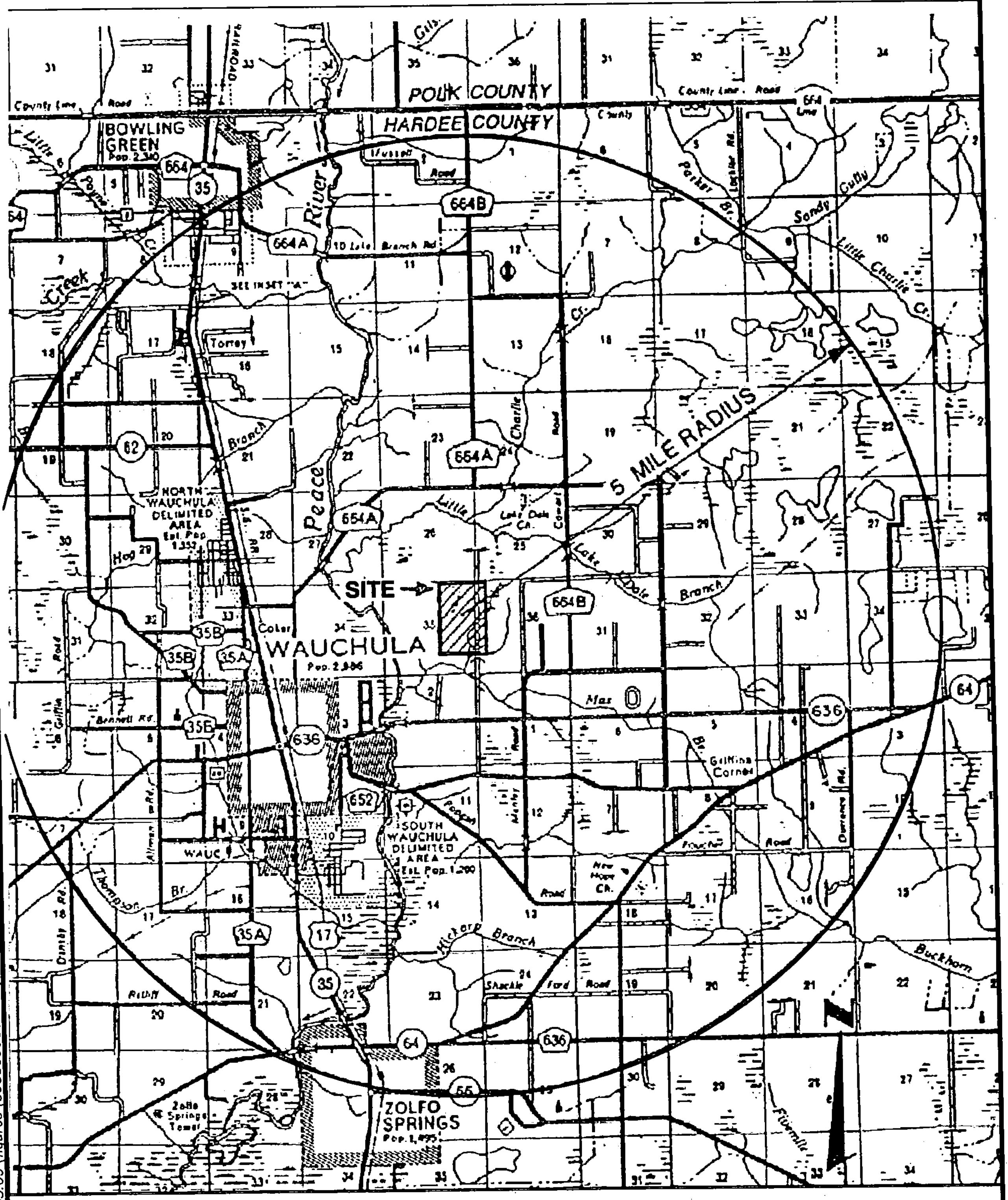
The permit applicant must be the governing body of a county or municipality or a third party under contract with a county or municipality and the project for which the fee reduction or waiver is sought must serve a public purpose. If a permit processing fee is reduced, the total fee shall not exceed $100.

History.--s. 1, ch. 94-278; s. 8, ch. 98-258.

Disclaimer: The information on this system is unverified. The journals or printed bills of the respective chambers should be consulted for official purposes. Copyright © 2000-2003 State of Florida. Privacy Statement.

ATTACHMENT E-2

REGIONAL MAP



G:\PROJECT\09199033.09\figures\093309USGS.dwg Feb 19, 2004 - 5:27pm Layout Name: Fig e-1 (regional) By: 2226lje

SCS ENGINEERS

Figure E–1. Regional Map Hardee County Landfill, Hardee County, Florida.

ATTACHMENT E-3

PROOF OF PROPERTY OWNERSHIP

IN-7-1998 07:45P FROM:

Original
Deed folder

Wauchula Abstract & Title Co., Inc.

123 South 9th Avenue
Wauchula, Florida 33873
Telephone: (863) 773-9054
Facsimile: (863) 773-5857

Date 7.5.02

Hardee County, a political subdivision
412 West Orange St, Rm A-203
Wauchula, FL 33873

RE: H20020393
Property around Landfill, Wauchula, Florida 33873

Dear Hardee County, a political subdivision:

Please find enclosed the following documents relative to the above captioned property:

X Recorded Warranty Deed
X Owner's Title Insurance Policy
___ Satisfaction
___ Release
___ Amortization Scheudule
___ Transfer of Title Application

After you have had an opportunity to review the enclosed, please feel free to contact us if you have any questions.

It has been a pleasure to have been of service to you, and we hope that we may be of service to you again in the future.

Respectfully,

Tina Hines
for:

Dorothy A. Conerly, President
Wauchula Abstract & Title Co., Inc.

DAC/tlh

enclosures

RECEIVED
JUL - 8 2002
HARDEE COUNTY
BOCC

AMERICAN LAND TITLE ASSOCIATION
OWNER'S POLICY (10-17-92)
(WITH FLORIDA MODIFICATIONS)

Policy No. 7210609-36946

CHICAGO TITLE INSURANCE COMPANY

SUBJECT TO THE EXCLUSIONS FROM COVERAGE, THE EXCEPTIONS FROM COVERAGE CONTAINED IN SCHEDULE B AND THE CONDITIONS AND STIPULATIONS, CHICAGO TITLE INSURANCE COMPANY, a Missouri corporation, herein called the Company, insures, as of Date of Policy shown in Schedule A, against loss or damage, not exceeding the Amount of Insurance stated in Schedule A, sustained or incurred by the insured by reason of:

1. Title to the estate or interest described in Schedule A being vested other than as stated therein;
2. Any defect in or lien or encumbrance on the title;
3. Unmarketability of the title;
4. Lack of a right of access to and from the land.

The Company will also pay the costs, attorneys' fees and expenses incurred in defense of the title, as insured, but only to the extent provided in the Conditions and Stipulations.

In Witness Whereof, CHICAGO TITLE INSURANCE COMPANY has caused this policy to be signed and sealed as of the Date of Policy shown in Schedule A, the policy to become valid when countersigned by an authorized signatory.

CHICAGO TITLE INSURANCE COMPANY

WAUCHULA ABSTRACT & TITLE
COMPANY, INC.
123 S. 9th Avenue
Wauchula, FL 33873

(863) 773-9054

By:

President

ATTEST

Secretary

Reorder Form No. 8218 (Reprinted 10/00)

OWNERS

SCHEDULE A

OFFICE FILE NUMBER	POLICY NUMBER	DATE OF POLICY	AMOUNT OF INSURANCE
1 H20020393	2 7210609-36946	3 May 16, 2002 12:04:34 PM	4 $ 88,400.00

Name of Insured:
Hardee County, a political subdivision of the State of Florida

2. The estate or interest in the land which is covered by this Policy is:

Fee Simple

3. Title to the estate or interest in the land is vested in the Insured.

4. The land herein described is encumbered by the following mortgage or trust deed, and assignments:

None

and the mortgages or trust deeds, if any, shown in Schedule B hereof.

5. The land referred to in this Policy is described as follows:

See Attached Owners Schedule A Continuation

This Policy valid only if Schedule B is attached.

ADDED PAGE

(Schedule A continued)

Policy Number 7210609-36946
Owners

Policy Number
Loan

Parcel 1:
Commence at the Northeast corner of Section 35, Township 33 South, Range 25 East, Hardee County, Florida; thence run S 89°51'17" W along the North line of said Section 35, which is also the South line of Section 26, Township 33 South, Range 25 East, a distance of 2,323.42 feet to the Point of Beginning; thence S 00°28'08" E, a distance of 2,316.45 feet; thence S 89°47'00" W, a distance of 250.00 feet; thence N 00°28'08" W, a distance of 2,317.86 feet to said North line of Section 35; thence S 89°51'17" W along said North line of Section, a distance of 250.00 feet to the Point of Beginning.

Together with
Parcel 2:
Commence at the Southeast corner of Section 26, Township 33 South, Range 25 East, Hardee County, Florida; thence run S 89°51'17" W along the South line of said Section 26, which is also the North line of Section 35, Township 33 South, Range 25 East, a distance of 663.83 feet to the Point of Beginning; thence continue S 89°51'17" W. along said South line of Section 26, a distance of 1,909.59 feet; thence N 00°28'08" W, a distance of 100.00 feet; thence N 89°51'17 E, a distance of 1,909.77 feet; thence S 00°22'10" E, a distance of 100.00 feet to the Point of Beginning.

POLICY FORM

SCHEDULE B

File No: H20020393

Policy Number: 7210609-36946

This policy does not insure against loss or damage (and the Company will not pay costs, attorneys' fees or expenses) which arise by reason of

General Exceptions:

(1) Rights or claims of parties in possession not shown by the public records.

(2) Encroachments, overlaps, boundary line disputes, and any other matters which would be disclosed by an accurate survey and inspection of the premises.

(3) Easements or claims of easements not shown by the public records.

(4) Any lien, or right to a lien, for services, labor or material heretofore or hereafter furnished, imposed by law and not shown by the public records.

(5) Taxes or special assessments which are not shown as existing liens by the public records.

Special Exceptions: The mortgage, if any, referred to in Item 4 of Schedule A., if this schedule is attached to an Owner's Policy.

(6) Any claim that any portion of said lands are sovereignty lands of the State of Florida, including submerged, filled or artificially exposed lands and lands accreted to such lands.

(7) Taxes and assessments for the year 2002 and subsequent years.

8. This Policy to be issued hereunder does not insure access to the insured land.

9. Schedule B, general exceptions 1, 4 and 6 are hereby deleted from said policy.

Countersigned Wauchula Abstract & Title Co., Inc.

Authorized Signature

Dorothy A. Conerly

Note: If this schedule is attached to a Loan Policy, junior and subordinate matters, if any, are not reflected herein.

Note: This Policy consists of insert pages labeled Schedules A and B. This Policy is of no force and effect unless both pages are included along with any added pages incorporated by reference.

JAN-1-1998 01:35P FROM

Corporate Warranty Deed

K26INST:2002003620 DATE:05/16/2002 TIME:12:04:34
DOC STAMP-DEED : 618.80
ML DC,B. HUGH BRADLEY,HARDEE COUNTY B:627 P:708

This Indenture, made this 15th day of May
A.D. 2002 , **Between**

Cargill Fertilizer, Inc.

whose post office address is: 8813 Highway 41 South
Riverview, Florida 33569

a corporation existing under the laws of the
State of Delaware , Grantor and
Hardee County, a political subdivision of
the State of Florida

whose post office address is: 412 West Orange Street, Room A-203
Wauchula, Florida 33873

Grantees' Tax Id # :
Grantee,

Witnesseth, that the said Grantor, for and in consideration of the sum of (Ten & NO/100
Dollars, to it in hand paid by the said Grantee, the receipt whereof is hereby acknowledged, has granted, bargained an
sold to the said Grantee forever, the following described land, situate, lying and being in the County of
HARDEE , State of Florida, to wit:
See Schedule A attached hereto and by this reference made a part
hereof.

Subject to covenants, restrictions and easements of record. Subject
also to taxes for 2002 and subsequent years.
Parcel Identification Number: 26-33-25-0000-02500-0000
And the said Grantor does hereby fully warrant the title to said land, and will defend the same against the lawf
claims of all persons whomsoever. Additional Parcel ID#: 35-33-25-0000-00040-0000
In Witness Whereof, the said Grantor has caused this instrument to be executed in its name by its du
authorized officer and caused its corporate seal to be affixed the day and year first above written.

Cargill Fertilizer, Inc.

By: Thomas E Myers III
Thomas E. Myers, III
Its Vice President

Signed and Sealed in Our Presence:

Carol J. Hancock
Witness Print Name: Carol J. Hancock

DAVID CURT WADE
Witness Print Name:

(Corporate Seal)

State of Florida
County of Polk

of Cargill Fertilizer, Inc.

a corporation existing under the laws of the State of Delaware, on behalf of the corporatic
He/She is personally known to me or has produced as identificatic

Notary Public
FREDA J. RIDGWAY
MY COMMISSION # CC 964001
EXPIRES: December 27, 2004
Bonded Thru Notary Public Underwriters
My Commission Expires: 12-27-2004

PREPARED BY: Dorothy A. Conerly
RECORD & RETURN TO:
Wauchula Abstract & Title Co., Inc.
123 South 9th Avenue
Wauchula, Florida 33873
File No: H20020393

CWD-1
6/99

Schedule A

Parcel 1:
Commence at the Northeast corner of Section 35, Township 33 South, Range 25 East, Hardee County, Florida; thence run S 89°51'17" W along the North line of said Section 35, which is also the South line of Section 26, Township 33 South, Range 25 East, a distance of 2,323.42 feet to the Point of Beginning; thence S 00°28'08" E, a distance of 2,316.45 feet; thence S 89°47'00" W, a distance of 250.00 feet; thence N 00°28'08" W, a distance of 2,317.86 feet to said North line of Section 35; thence S 89°51'17" W along said North line of Section, a distance of 250.00 feet to the Point of Beginning.

Together with
Parcel 2:
Commence at the Southeast corner of Section 26, Township 33 South, Range 25 East, Hardee County, Florida; thence run S 89°51'17" W along the South line of said Section 26, which is also the North line of Section 35, Township 33 South, Range 25 East, a distance of 663.83 feet to the Point of Beginning; thence continue S 89°51'17" W. along said South line of Section 26, a distance of 1,909.59 feet; thence N 00°28'08" W, a distance of 100.00 feet; thence N 89°51'17 E, a distance of 1,909.77 feet; thence S 00°22'10" E, a distance of 100.00 feet to the Point of Beginning.

INST:2002003620 DATE:05/16/2002 TIME:12:04:34
DOC STAMP-DEED : 618.80
mk DC,B. HUGH BRADLEY,HARDEE COUNTY B:627 P:709

File No: H20020393

This Instrument Prepared By:
GEORGE T. DUNLAP, III
DUNLAP & BLAKEMAN
P. O. Drawer 30
Bartow, Florida 33830

874866

SPECIAL WARRANTY DEED

THIS SPECIAL WARRANTY DEED Made the 1st day of July, 1987 by MOBIL OIL CORPORATION, a corporation existing under the laws of the State of New York, and having its principal place of business at New York, New York, hereinafter called the grantor, to HARDEE COUNTY, a political subdivision of the State of Florida, whose post office address is 412 West Orange Street, Wauchula, Florida 33873, hereinafter called the grantee:

WITNESSETH: That the grantor, for and in consideration of the sum of $10.00 and other valuable considerations, receipt whereof is hereby acknowledged, by these presents does grant, bargain, sell, alien, remise, release, convey and confirm unto the grantee, all that certain land situate in Hardee County, Florida, viz:

> Begin at the SE corner of the NE-1/4 of Section 35, Township 33 South, Range 25 East and go West 660 feet to the point of beginning, thence run North 2,640 feet, thence West 1,650 feet, thence South 2,310 feet, thence East 330 feet, thence South 330 feet, thence East 1,320 feet to the point of beginning.

TOGETHER with all the tenements, hereditaments and appurtenances thereto belonging or in anywise appertaining.

TO HAVE AND TO HOLD, the same in fee simple forever.

AND the grantor hereby covenants with said grantee that it is lawfully seized of said land in fee simple; that it has good right and lawful authority to sell and convey said land; that it hereby fully warrants the title to said land and will defend the same against the lawful claims of all persons claiming by, through or under the said grantor.

AND the grantee shall defend, indemnify and hold harmless the grantor, its agents, employees and assigns, from any and all losses, liabilities, penalties, expenses, damages, demands, and claims (including costs of defense and reasonable attorneys' fees) in connection with or arising out of any injury or alleged injury (including death) to any person, or damage or alleged damage to property, or contamination of or adverse effects on the environment, or any violation of governmental laws, regulations, orders, permits or permit conditions, caused or sustained or alleged to have been caused or sustained in connection with, or to have arisen out of or to have occurred in connection with, the use or occupancy of the land, whether by the grantee or by any transferee, lessee, assignee, licensee or contractor of the grantee or by any successor in interest to the grantee, and whether or not the event, cause, circumstance or condition giving rise to the claim or liability is (i) known or unknown as of the date hereof, or (ii) occurred prior or subsequent to the date hereof.

AND the grantee further agrees that the above obligations shall be inserted in any transfer, lease or assignment of the land or in any license or contract with respect to the use of the land, and that those obligations shall, to the extent legally permissible, be a covenant running with the land, binding on the grantee's successors and assigns and all other subsequent owners of the land.

AND the parties hereby acknowledge and confirm that the prior Lease Agreement between the parties regarding said lands is hereupon terminated.

IN WITNESS WHEREOF the grantor has caused these presents to be executed in its name, and its corporate seal to be hereunto affixed, by its proper officers thereunto duly authorized, the day and year first above written.

MOBIL OIL CORPORATION

(Corporate Seal)

SEAL

By J. P. Rogers
Attorney in Fact

By J. D'Ferro
Attorney in Fact

ATTEST: D. Byatt
Assistant Secretary

Signed, sealed and delivered in the presence of:

Dan E. Heath

M. M. Wolfley

STATE OF ~~NEW YORK~~ VIRGINIA
COUNTY OF ~~NEW YORK~~ HANOVER

I HEREBY CERTIFY that on this day, before me, an officer duly authorized in the State and County aforesaid to take acknowledgments, personally appeared J. P. Rogers and D. B. Wyatt and J. C. Ferro well known to me to be the Attorneys in Fact and Assistant Secretary of the corporation named as grantor in the foregoing deed, and that they severally acknowledged executing the same in the presence of two subscribing witnesses freely and voluntarily under authority duly vested in them by said corporation and that the seal affixed thereto is the true corporate seal of said corporation.

WITNESS my hand and official seal in the County and State last aforesaid this 1st day of July, 1987.

(Notarial Seal)

Carole W. Pemberton
Notary Public

My commission expires:

MY COMMISSION EXPIRES OCTOBER 6, 1990

FILED AND RECORDED IN
OFFICIAL RECORDS. RECORD VERIFIED
AUG 25 19 87 8:30 AM
COLEMON W. BEST, CLERK CIRCUIT CRT.
BY BC HARDEE COUNTY, FL

RECEIVED THIS 25 DAY OF
AUG 19 87 $ .55
IN PAYMENT OF DOCUMENTARY STAMPS
AND $ 0 INTANGIBLE TAX
COLEMON W. BEST
CLERK OF COURT
HARDEE COUNTY, FLORIDA
BY B. Sue Oliver D.C.

874866

INDEXED

WARRANTY DEED.

THIS INDENTURE, Made this 18th day of June A D 1921, between the Wauchula Development Co., a corporation existing under the laws of the State of Florida party of the first part, and W. A. COLE, party of the second part,

WITNESSETH: That the said party of the first part, for and in consideration of the sum of One dollar and other good and valuable considerations, to it in hand paid the receipt whereof is hereby acknowledged, has bargained, sold and transferred, unto the said party of the second part, his successors and assigns forever, all that certain parcel of land lying and being in the County of Hardee, State of Florida, more particularly described as follows:

West one half (W½) of the South-east one-quarter (SE¼) of the North-east one-quarter (NE¼) of Section Thirty-five (35) Township Thirty-three (33) South Range Twenty-five (25) East. ($1.00 U S Rev Stamps Cancelled)

Excepting and Reserving, however, unto the party of the first part, its successors and assigns, a strip of ground fifteen feet wide along section and half-section lines to be used as one-half of right of way for public roads.

And the said party of the first part does hereby fully warrant the title to said lands, and will defend the same against the lawful claims of all persons.

IN WITNESS WHEREOF, said party of the fir t part has caused these presents to be signed in its name by its President, and its corporate seal to be affixed, hereto, the day and year above written.

Signed, sealed and delivered in our presence as witnesses;
C L Richardson Jr
P M Dewey

CORPORATE SEAL

THE WAUCHULA DEVELOPMENT COMPANY
By H B Rainey
Vice-President.

STATE OF FLORIDA)
COUNTY OF HARDEE.)

I do hereby certify that on this 20th day of June A D 1921, before me personally appeared Homer B Rainey, Vice-President of The Wahchula Development Company, a corporation existing under the laws of the State of Florida, to me known to be the person described, in and who executed the foregoing conveyance and acknowledged the execution thereof to be his free act and deed as such officer for the uses and purposes therein mentioned, and that he caused to be affixed thereto the official seal of said corporation.

WITNESS my signature and official seal at Wauchula, in the County of Hardee State of Florida, the day and year aforesaid.

(S E A L)

C A Samuelson, (Seal) Notary Public, State of Florida. My commission as Notary expires on the 8 day of January 1922.

I Hereby certify that the above and foregoing is a true and correct copy of the original as filed for record this the 21st day of December 1921.

Geo M Hardee
Clerk Circuit Court
By Millie Warren
Deputy Clerk

Wauchula Abstract & Title Co., Inc.
Abstracts - Title Insurance - Title Searches
PHONE 773-9054 & 773-4378 P. O. BOX 1028 123 SOUTH 9TH AVE.
WAUCHULA, FLORIDA 33873 #87-827

October 23, 1987, at 5:00 P. M.

Board of County Commissioners
Hardee County
Public Works Department
412 West Orange Street
Wauchula, Florida 33873

Gentlemen:

This is to certify that we have made a search of the public records of Hardee County, Florida, regarding the root title to the following described property:

See Schedule "A" attached hereto

We find root title to this property begins with a Deed from The Trustees of the Internal Improvement Fund of the State of Florida to Florida Southern Railway Company, dated April 9, 1886, filed August 10, 1888, and recorded in Deed Book 4, page 773, re-recorded in Deed Book 17, page 95, Public Records of DeSoto County, Florida, as to E½ of NE¼ of Section 35, Township 33 South, Range 25 East;

and with a Patent from the United States of America to Henry W. Edwards, dated September 24, 1912, filed January 23, 1913, and recorded in Deed Book 93, page 19, Public Records of DeSoto County, Florida, as to W½ of NE¼ of Section 35, Township 33 South, Range 25 East.

We find that the E½ of NE¼ was patented by the United States of America to the State of Florida as shown in Mayo Certificate recorded in O. R. Book 63, page 257.

Title was searched from date of the above Deed and Patent to and including October 23, 1987, at 5:00 P. M., and we find the fee simple title vested in:

Hardee County, a political subdivision of the State of Florida

by virtue of that certain Special Warranty Deed from Mobil Oil Corporation, a corporation existing under the laws of the State of New York, to Hardee County, a political subdivision of the State of Florida, dated July 1, 1987, filed August 25, 1987, and recorded in O. R. Book 342, page 547;

and by virtue of that certain Easement from Mobil Oil Corporation, a New York corporation, to Hardee County, a political subdivision of the State of Florida, dated July 1, 1987, filed August 25, 1987, and recorded in O. R. Book 342, page 549.

Subject to the following:

(1) Outstanding mineral rights of record as to the SE¼ of SE¼ of NE¼ and affects the property described in the Easement only.

(2) Special Warranty Deed from Mobil Oil Corporation to Hardee County recorded in O. R. Book 342, page 547, was signed in name of Mobil Oil Corporation by J. P. Rogers and D. C. Ferro as Attorney-in-Fact. No Power of Attorney for either party is recorded in public records of Hardee County.

(3) Easement from Mobil Oil Corporation to Hardee County recorded in O. R. Book 342, page 549, was signed in name of Mobil Oil Corporation by J. P. Rogers, Attorney-in-Fact. No Power of Attorney is recorded in Public Records of Hardee County.

(4) Reservation of a strip of ground 15 feet wide along section and half section lines to be used as one-half of right of way for public roads in Deed Book 1, page 407, public records of Hardee County, Florida.

(5) Obligations and Hold Harmless agreement set out in Special Warranty Deed from Mobil Oil Corporation to Hardee County, filed August 25, 1987, and recorded in O. R. Book 342, page 547.

(6) Obligations and Hold Harmless agreement as set out in Easement from Mobil Oil Corporation to Hardee County, filed August 25, 1987, and recorded in O. R. Book 342, page 549.

The County Taxes are paid up to and including 1986.

We find no other reservations or easements of record except as shown above.

There are no outstanding mortgages, liens or other encumbrances of any kind against the foregoing described land for the time covered by this Certificate.

This report is not to be construed as a Certificate of Title or a Guaranty of said Title, but is limited to the record information specified above. Liability hereunder shall be limited to the amount paid for this report.

Respectfully,

WAUCHULA ABSTRACT & TITLE CO., INC.

Max A. Campbell

Max A. Campbell, President

MAC:afn

Attachments

SCHEDULE "A"

Begin at the Southeast corner of the NE¼ of Section 35, Township 33 South, Range 25 East, and go West 660 feet to the Point of Beginning, thence run North 2,640 feet, thence West 1,650 feet, thence South 2,310 feet, thence East 330 feet, thence South 330 feet, thence East 1,320 feet to the Point of Beginning;

Together with an non-exclusive easement over, along and across the real property located in Hardee County, Florida, described as follows:

Begin at the Southeast corner of the NE¼ of Section 35, Township 33 South, Range 25 East, and go West 660 feet, thence North 455 feet to a Point of Beginning, being a tract of land 30 feet right and 30 feet left of the following described line: From a point of beginning proceed East approximately 660 feet to the centerline of Airport Road.

Wauchula Abstract & Title Co., Inc.
Abstracts - Title Insurance - Title Searches
PHONE 773-9054 & 773-4378 P. O. BOX 1028 123 SOUTH 9TH AVE.
WAUCHULA, FLORIDA 33873 #87-827

October 23, 1987, at 5:00 P. M.

Board of County Commissioners
Hardee County
Public Works Department
412 West Orange Street
Wauchula, Florida 33873

Gentlemen:

This is to certify that we have made a search of the public records of Hardee County, Florida, regarding the root title to the following described property:

See Schedule "A" attached hereto

We find root title to this property begins with a Deed from The Trustees of the Internal Improvement Fund of the State of Florida to Florida Southern Railway Company, dated April 9, 1886, filed August 10, 1888, and recorded in Deed Book 4, page 773, re-recorded in Deed Book 17, page 95, Public Records of DeSoto County, Florida, as to E½ of NE¼ of Section 35, Township 33 South, Range 25 East;

and with a Patent from the United States of America to Henry W. Edwards, dated September 24, 1912, filed January 23, 1913, and recorded in Deed Book 93, page 19, Public Records of DeSoto County, Florida, as to W½ of NE¼ of Section 35, Township 33 South, Range 25 East.

We find that the E½ of NE¼ was patented by the United States of America to the State of Florida as shown in Mayo Certificate recorded in O. R. Book 63, page 257.

Title was searched from date of the above Deed and Patent to and including October 23, 1987, at 5:00 P. M., and we find the fee simple title vested in:

Hardee County, a political subdivision of the State of Florida

by virtue of that certain Special Warranty Deed from Mobil Oil Corporation, a corporation existing under the laws of the State of New York, to Hardee County, a political subdivision of the State of Florida, dated July 1, 1987, filed August 25, 1987, and recorded in O. R. Book 342, page 547;

and by virtue of that certain Easement from Mobil Oil Corporation, a New York corporation, to Hardee County, a political subdivision of the State of Florida, dated July 1, 1987, filed August 25, 1987, and recorded in O. R. Book 342, page 549.

Subject to the following:

(1) Outstanding mineral rights of record as to the SE¼ of SE¼ of NE¼ and affects the property described in the Easement only.

(2) Special Warranty Deed from Mobil Oil Corporation to Hardee County recorded in O. R. Book 342, page 547, was signed in name of Mobil Oil Corporation by J. P. Rogers and D. C. Ferro as Attorney-in-Fact. No Power of Attorney for either party is recorded in public records of Hardee County.

(3) Easement from Mobil Oil Corporation to Hardee County recorded in O. R. Book 342, page 549, was signed in name of Mobil Oil Corporation by J. P. Rogers, Attorney-in-Fact. No Power of Attorney is recorded in Public Records of Hardee County.

(4) Reservation of a strip of ground 15 feet wide along section and half section lines to be used as one-half of right of way for public roads in Deed Book 1, page 407, public records of Hardee County, Florida.

(5) Obligations and Hold Harmless agreement set out in Special Warranty Deed from Mobil Oil Corporation to Hardee County, filed August 25, 1987, and recorded in O. R. Book 342, page 547.

(6) Obligations and Hold Harmless agreement as set out in Easement from Mobil Oil Corporation to Hardee County, filed August 25, 1987, and recorded in O. R. Book 342, page 549.

The County Taxes are paid up to and including 1986.

We find no other reservations or easements of record except as shown above.

There are no outstanding mortgages, liens or other encumbrances of any kind against the foregoing described land for the time covered by this Certificate.

This report is not to be construed as a Certificate of Title or a Guaranty of said Title, but is limited to the record information specified above. Liability hereunder shall be limited to the amount paid for this report.

Respectfully,

WAUCHULA ABSTRACT & TITLE CO., INC.

Max A. Campbell

Max A. Campbell, President

MAC:afn

Attachments

SCHEDULE "A"

Begin at the Southeast corner of the NE¼ of Section 35, Township 33 South, Range 25 East, and go West 660 feet to the Point of Beginning, thence run North 2,640 feet, thence West 1,650 feet, thence South 2,310 feet, thence East 330 feet, thence South 330 feet, thence East 1,320 feet to the Point of Beginning;

Together with an non-exclusive easement over, along and across the real property located in Hardee County, Florida, described as follows:

Begin at the Southeast corner of the NE¼ of Section 35, Township 33 South, Range 25 East, and go West 660 feet, thence North 455 feet to a Point of Beginning, being a tract of land 30 feet right and 30 feet left of the following described line: From a point of beginning proceed East approximately 660 feet to the centerline of Airport Road.

This Instrument Prepared By:
GEORGE T. DUNLAP, III
DUNLAP, & BLAKEMAN
P. O. Drawer 30
Bartow, Florida 33830

874866

SPECIAL WARRANTY DEED

THIS SPECIAL WARRANTY DEED Made the 1st day of July, 1987 by MOBIL OIL CORPORATION, a corporation existing under the laws of the State of New York, and having its principal place of business at New York, New York, hereinafter called the grantor, to HARDEE COUNTY, a political subdivision of the State of Florida, whose post office address is 412 West Orange Street, Wauchula, Florida 33873, hereinafter called the grantee:

WITNESSETH: That the grantor, for and in consideration of the sum of $10.00 and other valuable considerations, receipt whereof is hereby acknowledged, by these presents does grant, bargain, sell, alien, remise, release, convey and confirm unto the grantee, all that certain land situate in Hardee County, Florida, viz:

> Begin at the SE corner of the NE-1/4 of Section 35, Township 33 South, Range 25 East and go West 660 feet to the point of beginning, thence run North 2,640 feet, thence West 1,650 feet, thence South 2,310 feet, thence East 330 feet, thence South 330 feet, thence East 1,320 feet to the point of beginning.

TOGETHER with all the tenements, hereditaments and appurtenances thereto belonging or in anywise appertaining.

TO HAVE AND TO HOLD, the same in fee simple forever.

AND the grantor hereby covenants with said grantee that it is lawfully seized of said land in fee simple; that it has good right and lawful authority to sell and convey said land; that it hereby fully warrants the title to said land and will defend the same against the lawful claims of all persons claiming by, through or under the said grantor.

AND the grantee shall defend, indemnify and hold harmless the grantor, its agents, employees and assigns, from any and all losses, liabilities, penalties, expenses, damages, demands, and claims (including costs of defense and reasonable attorneys' fees) in connection with or arising out of any injury or alleged injury (including death) to any person, or damage or alleged damage to property, or contamination of or adverse effects on the environment, or any violation of governmental laws, regulations, orders, permits or permit conditions, caused or sustained or alleged to have been caused or sustained in connection with, or to have arisen out of or to have occurred in connection with, the use or occupancy of the land, whether by the grantee or by any transferee, lessee, assignee, licensee or contractor of the grantee or by any successor in interest to the grantee, and whether or not the event, cause, circumstance or condition giving rise to the claim or liability is (i) known or unknown as of the date hereof, or (ii) occurred prior or subsequent to the date hereof.

AND the grantee further agrees that the above obligations shall be inserted in any transfer, lease or assignment of the land or in any license or contract with respect to the use of the land, and that those obligations shall, to the extent legally permissible, be a covenant running with the land, binding on the grantee's successors and assigns and all other subsequent owners of the land.

AND the parties hereby acknowledge and confirm that the prior Lease Agreement between the parties regarding said lands is hereupon terminated.

IN WITNESS WHEREOF the grantor has caused these presents to be executed in its name, and its corporate seal to be hereunto affixed, by its proper officers thereunto duly authorized, the day and year first above written.

MOBIL OIL CORPORATION

(Corporate Seal)

By J. P. Rogers Attorney in Fact

By J. D'Ferro Attorney in Fact

ATTEST: D. Bryant Assistant Secretary

Signed, sealed and delivered in the presence of:

Don E. Heath

M. R. Wolfe

Cap STATE OF ~~NEW YORK~~ VIRGINIA
COUNTY OF ~~NEW YORK~~ HANOVER

I HEREBY CERTIFY that on this day, before me, an officer duly authorized in the State and County aforesaid to take acknowledgments, personally appeared J. P. Rogers and J. C. Ferro and D. B. Bryant well known to me to be the Attorneys in Fact and Assistant Secretary of the corporation named as grantor in the foregoing deed, and that they severally acknowledged executing the same in the presence of two subscribing witnesses freely and voluntarily under authority duly vested in them by said corporation and that the seal affixed thereto is the true corporate seal of said corporation.

WITNESS my hand and official seal in the County and State last aforesaid this 1st day of July, 1987.

(Notarial Seal)

Carole W. Pemberton
Notary Public

My commission expires:

MY COMMISSION EXPIRES OCTOBER 6, 1990

FILED AND RECORDED IN OFFICIAL RECORDS, RECORD VERIFIED AUG 25 19 87 8:30 AM COLEMON W. BEST, CLERK CIRCUIT CRT. BY BSC HARDEE COUNTY, FL

RECEIVED THIS 25 DAY OF AUG 19 87 $ .55 IN PAYMENT OF DOCUMENTARY STAMPS AND $ 0 INTANGIBLE TAX COLEMON W. BEST CLERK OF COURT HARDEE COUNTY, FLORIDA BY B Sue Conner D.C.

874866

WARRANTY DEED.

THIS INDENTURE, Made this 18th day of June A D 1921, between The Wauchula Development Co, a corporation existing under the laws of the State of Florida, party of the first part, and W. A. COLE, party of the second part,

WITNESSETH: That the said party of the first part, for and in consideration of the sum of One dollar and other good and valuable considerations, to it in hand paid the receipt whereof is hereby acknowledged, has bargained, sold and transferred, unto the said party of the second part, his successors and assigns forever, all that certain parcel of land lying and being in the County of Hardee, State of Florida, more particularly described as follows:

West one half (W½) of the South-east one-quarter (SE¼) of the North-east one-quarter (NE¼) of Section Thirty-five (35) Township Thirty-three (33) South Range Twenty-five (25) East. ($1.00 U S Rev Stamps Cancelled)

Excepting and Reserving, however, unto the party of the first part, its successors and assigns, a strip of ground fifteen feet wide along section and half-section lines to be used as one-half of right of way for public roads.

And the said party of the first part does hereby fully warrant the title to said lands, and will defend the same against the lawful claims of all persons.

IN WITNESS WHEREOF, said party of the fir t part has caused these presents to be signed in its name by its President, and its corporate seal to be affixed, hereto, the day and year above written.

Signed, sealed and delivered in our presence as witnesses;

C L Richardson Jr

P M Dewey

CORPORATE SEAL

THE WAUCHULA DEVELOPMENT COMPANY

By H B Rainey

Vice-President.

STATE OF FLORIDA)

COUNTY OF HARDEE.)

I do hereby certify that on this 20th day of June A D 1921, before me personally appeared Homer B Rainey, Vice-President of The Wauchula Development Company, a corporation existing under the laws of the State of Florida, to me known to be the person described, in and who executed the foregoing conveyance and acknowledged the execution thereof to be his free act and deed as such officer for the uses and purposes therein mentioned, and that he caused to be affixed thereto the official seal of said corporation.

WITNESS my signature and official seal at Wauchula, in the County of Hardee State of Florida, the day and year aforesaid.

(S E A L)

C A Samuelson, (Seal) Notary Public, State of Florida. My commission as Notary expires on the 8 day of January 1925.

I Hereby certify that the above and foregoing is a true and correct copy of the original as filed for record this the 21st day of December 1921.

Geo M Hardee

Clerk Circuit Court

By Milia Warren

Deputy Clerk

ATTACHMENT E-4

PROOF OF PUBLICATION
(To be forwarded upon receipt after publication)

ATTACHMENT E-5

FLORIDA DEPARTMENT OF TRANSPORTATION RESPONSE LETTER

Florida Department of Transportation

JEB BUSH
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JOSÉ ABREU
SECRETARY

Aviation Office
March 28, 2003

RECEIVED
APR - 7 2003
SCS ENGINEERS

Ms. Lindsey Kennelly, E.I.
SCS Engineers
3012 U.S. Highway 301 North, Suite 700
Tampa, FL 33619-2242

Dear Ms. Kennelly:

This letter is in response to your letter received March 28, 2003, requesting information regarding the location of airport runways 1) using piston engine aircraft within 5,000 feet of Hardee County Landfill; 2) using turbine powered aircraft within 10,000 feet of Hardee County Landfill; and 3) within 5 miles of the Hardee County Landfill, Hardee County, Florida.

Upon completion of our analysis, there are no airports that lie within the criteria described above. Wauchula Municipal Airport is the closest airport, 6.75 statute miles southwest of Point #8, Latitude 27-34-4.32 and Longitude 81-47-3.20, per the Hardee County Landfill Site Plan provided.

For future reference, Florida airport facility information is located on FDOT's Aviation Database web site, http://www.florida-aviation-database.com. Select FDOT Aviation Facility Directory to begin your search. A graphical search may suite your needs.

Please do not hesitate to contact me at 850-414-4514, if you have any questions or need further assistance.

Sincerely,

Aaron N. Smith
Airspace and Land Use Manager

Attached: Public Airports in Proximity of Case Study
Private Landing Facilities in Proximity of Case Study

Study: HARDEELANDFILL

Wauchula, FL

Site Information

Latitude:............	27-34-4.32	27.5678666666667
Longitude:............	81-47-3.2	81.7842222222222
Ground Elevation:.....	80 feet AMSL	
Structure Height:.....	50 feet AGL	
Overall Height:.......	130 feet AMSL	

City Information

Nearest City:..... **Wauchula, FL**

Distance:......... **2.2 Statute Miles**

Direction:........ **225 Degrees (true bearing)**

Nearest Landing Facility Information

Analyzed by Airspace® on: 03-28-2003. Using AIRSPACE® Version 8.0.1

Nearest Public Use landing facility is: **CHN: WAUCHULA MUNI**

Distance to ARP is: **36638 ft. or 6.0298 nm.**

Direction to ARP is: **238.15 degrees (true bearing)**

Distance to the nearest runway is: **35642 ft. or 5.8659 nm.**

DNE FAR 77.13(a)(1). DNE FAR 77.13(a)(2).

~~LOWEST MOCA FOUND: 1400 AMSL ON AIRWAY V157~~

INFORMATION ONLY

Private use landing facilities are not studied under FAR Part 77.

Nearest Private Use landing facility is: **GRIFFINS PEACE RIVER RANCH**
Distance to this facility is: **9.277 NM**
Direction to this facility is: **196.14 degrees.**

Date Printed: 03-28-2003

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*********************************************
*   PUBLIC AIRPORTS IN PROXIMITY OF CASE    *
*********************************************
```

File: HARDEELANDFILL

OVERALL ELEVATION (AMSL): 130
LATITUDE: 27-34-4.32
LONGITUDE: 81-47-3.2

ACIL DENT	TYP	NAME	BEARING To FACIL	DISTANCE IN N.M.	DELTA ARP ELEVATION	FAR P77
HN	AIR	WAUCHULA MUNI	238.15	6.03	+24	YES

This facility has at least one runway over 3,200 feet in length.

Your structure DNE FAR 77.13(a)(1) or 77.13(a)(2) Notice Criteria for this airport. However, you may EXCEED other Notice Standards. As a minimum, please review reports for FAR Part 77 Obstruction Surfaces, Air Navigation and Communication facilities.

You are 35642 feet from the nearest runway threshold and the threshold elevation is 100 feet. Please review runway analysis for remaining airport surfaces.

No Circling or Straight-In Instrument Approach Procedures were found for this landing facility or your proposed location is greater than 10 nautical miles from the airport. No Expected Terps® impact.

AVO	AIR	AVON PARK MUNI	84.13	13.743	-25	YES

This facility has at least one runway over 3,200 feet in length.

Your structure DNE FAR 77.13(a)(1) or 77.13(a)(2) Notice Criteria for this port. However, you may EXCEED other Notice Standards. As a minimum, please view reports for FAR Part 77 Obstruction Surfaces, Air Navigation and Communication facilities.

You are 80943 feet from the nearest runway threshold and the threshold elevation is 165 feet. Please review runway analysis for remaining airport surfaces.

No Circling or Straight-In Instrument Approach Procedures were found for this landing facility or your proposed location is greater than 10 nautical miles from the airport. No Expected Terps® impact.

FD65	HEL	BARTOW HIGH SCHOOL	350.8	18.92	+14	YES

Your structure DOES NOT EXCEED FAR 77.13(a)(2) Notice Criteria for this heliport. You are not locating within 5,000 feet of facility. You are beyond limit by: 109959.8 feet.

9FD3	HEL	HIGHLANDS REGIONAL MEDICAL C	108.14	19.751	+24	YES

Your structure DOES NOT EXCEED FAR 77.13(a)(2) Notice Criteria for this heliport. You are not locating within 5,000 feet of facility. You are beyond limit by: 115009.1 feet.

17FD	HEL	SHERIFFS HELISTOP	350.77	20.134	+10	YES

Your structure DOES NOT EXCEED FAR 77.13(a)(2) Notice Criteria for this heliport. You are not locating within 5,000 feet of facility. You are beyond limit by: 117336.2 feet.

FD85	HEL	DE SOTO MEMORIAL HOSPITAL	189.85	20.67	+65	YES

Your structure DOES NOT EXCEED FAR 77.13(a)(2) Notice Criteria for this heliport. You are not locating within 5,000 feet of facility. You are beyond limit by: 120593 feet.

X07	AIR	LAKE WALES MUNI	24.09	21.356	+3	YES

This facility has at least one runway over 3,200 feet in length.

Your structure DNE FAR 77.13(a)(1) or 77.13(a)(2) Notice Criteria for this airport. However, you may EXCEED other Notice Standards. As a minimum, please review reports for FAR Part 77 Obstruction Surfaces, Air Navigation and Communication facilities.

You are 128022 feet from the nearest runway threshold and the threshold elevation is 126 feet. Please review runway analysis for remaining airport surfaces.

No Circling or Straight-In Instrument Approach Procedures were found for this landing facility or your proposed location is greater than 10 nautical miles from the airport. No Expected Terps® impact.

'D62 HEL MULBERRY HIGH SCHOOL 333.16 22.075 +5 YES

Your structure DOES NOT EXCEED FAR 77.13(a)(2) Notice Criteria for this heliport. You are not locating within 5,000 feet of facility. You are beyond limit by: 129129.9 feet.

3OW AIR BARTOW MUNI .12 22.465 +5 YES

This facility has at least one runway over 3,200 feet in length.

Your structure DNE FAR 77.13(a)(1) or 77.13(a)(2) Notice Criteria for this airport. However, you may EXCEED other Notice Standards. As a minimum, please review reports for FAR Part 77 Obstruction Surfaces, Air Navigation and Communication facilities.

You are 134626 feet from the nearest runway threshold and the threshold elevation is 109 feet. Please review runway analysis for remaining airport surfaces.

No Circling or Straight-In Instrument Approach Procedures were found for this landing facility or your proposed location is greater than 10 nautical miles from the airport. No Expected Terps® impact.

X06 AIR ARCADIA MUNI 187.16 22.669 +70 YES

This facility has at least one runway over 3,200 feet in length.

Your structure DNE FAR 77.13(a)(1) or 77.13(a)(2) Notice Criteria for this airport. However, you may EXCEED other Notice Standards. As a minimum, please review reports for FAR Part 77 Obstruction Surfaces, Air Navigation and Communication facilities.

You are 135126 feet from the nearest runway threshold and the threshold elevation is 57 feet. Please review runway analysis for remaining airport surfaces.

No Circling or Straight-In Instrument Approach Procedures were found for this landing facility or your proposed location is greater than 10 nautical miles from the airport. No Expected Terps® impact.

AGR AIR MACDILL AFB AUX FLD 77.85 23.697 +62 YES

This facility has at least one runway over 3,200 feet in length.

Your structure DNE FAR 77.13(a)(1) or 77.13(a)(2) Notice Criteria for this airport. However, you may EXCEED other Notice Standards. As a minimum, please review reports for FAR Part 77 Obstruction Surfaces, Air Navigation and Communication facilities.

You are 142655 feet from the nearest runway threshold and the threshold elevation is 64 feet. Please review runway analysis for remaining airport surfaces.

No Circling or Straight-In Instrument Approach Procedures were found for this landing facility or your proposed location is greater than 10 nautical miles from the airport. No Expected Terps® impact.

SEF AIR SEBRING REGIONAL 105.9 24.506 +67 YES

This facility has at least one runway over 3,200 feet in length.

Your structure DNE FAR 77.13(a)(1) or 77.13(a)(2) Notice Criteria for this ɔort. However, you may EXCEED other Notice Standards. As a minimum, please ɪew reports for FAR Part 77 Obstruction Surfaces, Air Navigation and Communication facilities.

You are 146777 feet from the nearest runway threshold and the threshold elevation is 54 feet. Please review runway analysis for remaining airport surfaces.

No Circling or Straight-In Instrument Approach Procedures were found for this landing facility or your proposed location is greater than 10 nautical miles from the airport. No Expected Terps® impact.

THE NEAREST AIRPORT TO CASE COORDINATES IS: CHN

WAUCHULA MUNI is an Airport type landing facility and is associated with the city of WAUCHULA, FL. The facility is eligible for Study under FAR Part 77 sub-Part C.

Its Reference Point (ARP) elevation is: 106 feet AMSL and you are locating 36637 feet from this landing facility.

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03-28-2003
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The mathematical algorithms used by this program are derived directly from Federal Aviation Regulations Part 77, sub-part C.

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***********************************************************
*   PRIVATE LANDING FACILITIES IN PROXIMITY OF CASE   *
***********************************************************
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File: HARDEELANDFILL

OVERALL ELEVATION (AMSL): 130

LATITUDE: 27-34-4.32
LONGITUDE: 81-47-3.2

FACIL IDENT	TYP	NAME	BEARING To FACIL	DISTANCE IN N.M.	DELTA ARP ELEVATION	FAR P77
FL00	AIR	GRIFFINS PEACE RIVER RANCH	196.14	9.277	+65	NO
FL01	AIR	CREWS HOMESTEAD RANCH	70.95	9.788	+40	NO
FD40	AIR	GARDNER	181.85	13.372	+54	NO
FA67	HEL	WALKER MEMORIAL MEDICAL CENTER	74.67	14.688	+10	NO
3FL9	HEL	SUN N LAKE	96.88	14.739	-26	NO
FA52	HEL	FLORIDA HOSPITAL-SEBRING	97	14.773	-24	NO
52FL	AIR	LAKE CLINCH AIRPARK	47.59	16.201	-10	NO
0FA1	AIR	FRIERSON GROVE	197.98	16.604	+65	NO
38FD	HEL	GRIFFIN'S MAIN OFFICE	52.96	16.821	+5	NO
FD46	SEA	GODDARD SEADROME	52.02	18.251	+52	NO
67FL	AIR	MYAKKA HEAD	248.49	18.385	+50	NO
6FL1	AIR	SUNSHINE RANCHETTES	127.37	20.108	-10	NO
1FL7	HEL	BARTOW MEMORIAL HOSPITAL	351.25	21.253	+23	NO
9FL3	SEA	LAKE JOSEPHINE	118.27	21.648	+45	NO
FA27	AIR	ELLSWORTH FIELD	179.01	21.68	+70	NO
FA03	AIR	SOUTHFORK	275.75	21.893	+21	NO
8FL5	HEL	DANCING OAKS	349.52	23.158	+23	NO
8FL1	AIR	MC DONALD'S FIELD	197.52	23.273	+76	NO
03FA	AIR	LAKE PERSIMMON AIRSTRIP	122.71	23.834	+60	NO
FA45	HEL	LAKE WALES	30.98	24.32	+5	NO
30FA	HEL	FLORIDA HOSPITAL LAKE PLACID	123.92	26.585	-11	NO
90FD	AIR	GRIFFIN BLUE HEAD RANCH	152.06	27.465	+53	NO
09FA	AIR	PLACID LAKES	134.3	27.649	+0	NO
FA60	AIR	VINCE'S CONDOMINIUM ASSOCIATIO	132.87	28.978	+15	NO
FL78	AIR	LEWIS	313.11	29.009	+85	NO
9FD0	SEA	SAGE SEADROME	41.8	30.359	+77	NO
FD72	AIR	KINGS PORT	137.71	31.188	-18	NO

THE NEAREST PRIVATE USE LANDING FACILITY IS: GRIFFINS PEACE RIVER RANCH

GRIFFINS PEACE RIVER RANCH is an Airport type landing facility.
The facility is not eligible for Study under FAR Part 77 sub-Part C.

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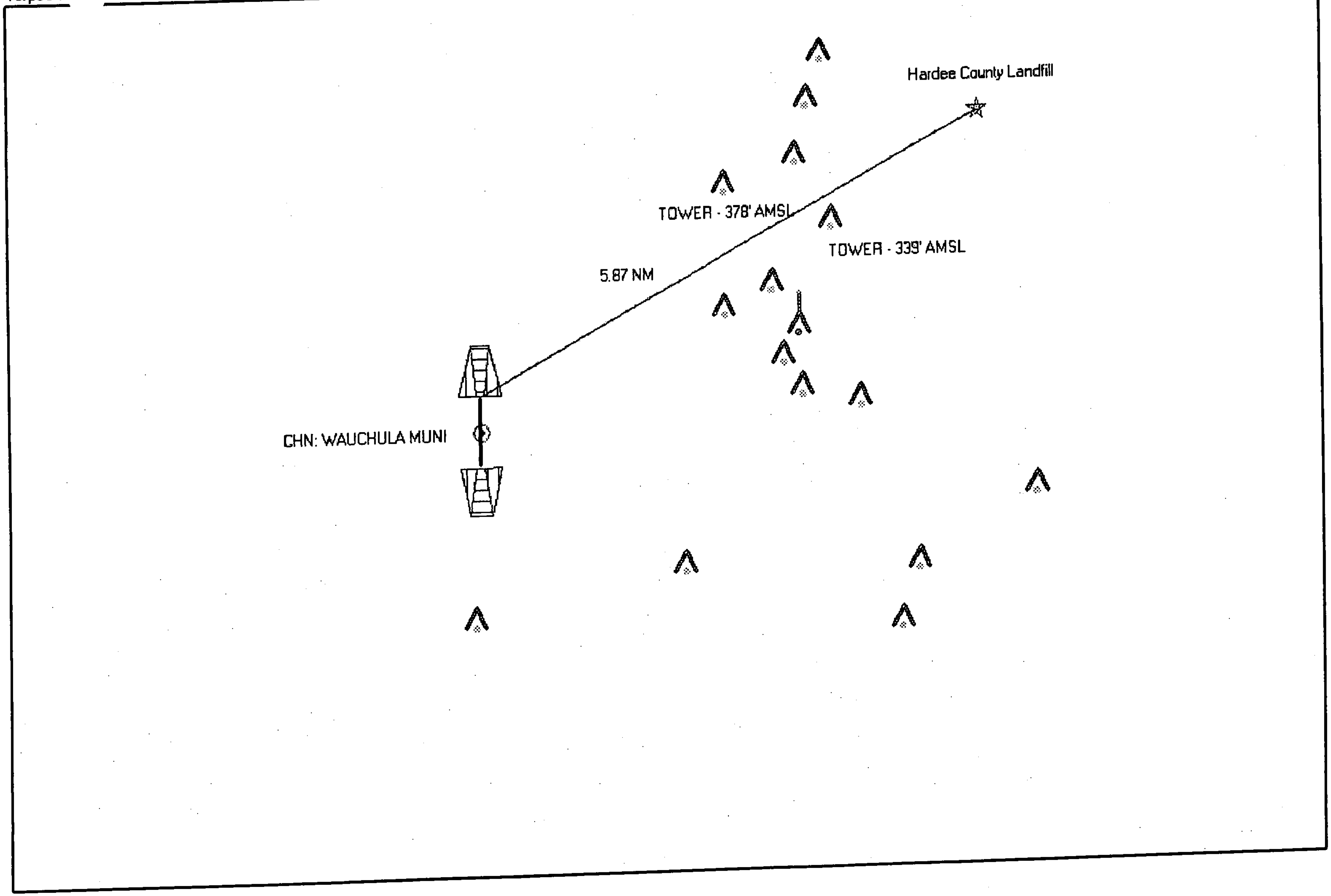
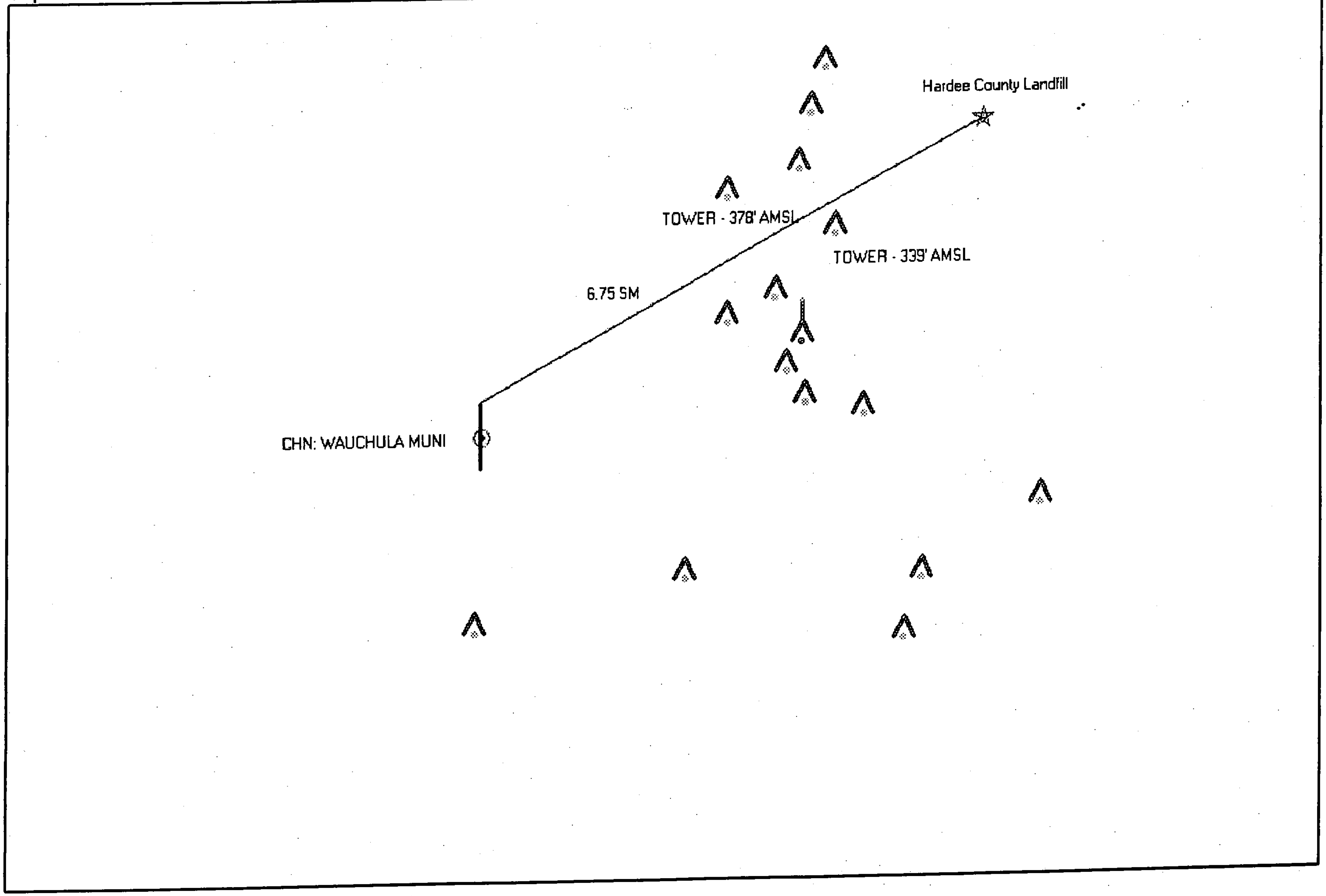
03-28-2003
15:46:00

The mathematical algorithms used by this program are derived directly from Federal Aviation Regulations Part 77, sub-part C.


Hardee County Landfill
TOWER - 378' AMSL
TOWER - 339' AMSL
5.87 NM
CHN: WAUCHULA MUNI


Hardee County Landfill
TOWER - 378' AMSL
TOWER - 339' AMSL
6.75 SM
CHN: WAUCHULA MUNI

SECTION F

LANDFILL PERMIT REQUIREMENTS

F.1 LAND USE AND ZONING MAP

An aerial photograph is included as Sheet 2 of the permit drawings. The photograph shows the area within one mile of the perimeter of the site. It depicts land use, major roads, water bodies, and other significant features.

The Hardee County Landfill is zoned as Agriculture (A-1) and the land use is designated as Public Institution.

Within a 1-mile radius of the landfill, a metal recycling facility located on Airport Road and is Zoned "Industrial 1" and the former Wauchula Airport and Landfill, located at the intersection of Airport Road and SR 636 is Zoned "City".

Within a 1-mile radius of the landfill, the land use of all surrounding properties is designated as "Agricultural" with the exception of the former Wauchula Airport and Landfill that is designated as "City" land use.

The Zoning and Land Use Maps, obtained from Hardee County, for the areas surrounding the Landfill are contained in Attachment F-1.

F.2 AIRPORT LOCATION PLAN

Figure E-1, located in Attachment E-2 is a vicinity map showing the area within five miles of the site property boundary. As depicted on the figure and verified with the FDOT, there are no airports or landing facilities located within a five-mile radius of the landfill site.

F.3 PLOT PLAN

The Landfill property boundary and dimensions are shown on Sheet 3 of the permit drawings and shown on the property ownership records are contained in Attachment E-3 of this permit application. Chastain Skillman conducted a complete property survey of the entire property and the limits are shown on Sheet 3 of the permit drawings.

The locations of the existing groundwater monitoring wells and piezometers are depicted on Sheet 3 of the permit drawings. The proposed expansion will require four monitoring wells and four piezometers to be abandoned. The location of the abandoned and proposed monitoring wells and piezometers are located on Sheet 27.

Several previous geotechnical investigations of the site and geotechnical investigation specifically performed for the expansion area have been performed and the boring locations and soil strata information are contained in Attachment J-1.

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
TAMPA

The proposed Class I disposal area (designated ~~as Phase II~~), including previously filled waste disposal areas, is outlined on Sheets 4 and 5 of the enclosed permit drawings. The operational fill sequence plans for the Phase I disposal area was previously submitted to FDEP and approved. The expansion area construction limits for Phase II Section I are shown on Sheets 9&10 and Phase II Section II on Sheets 12 and 13.

Cross sections showing the original elevations and the proposed final fill contours are shown on Sheets 16&17 of the enclosed permit drawings.

Fencing and gates used to restrict site access are depicted on Sheet 3 of the permit drawings.

F.4 TOPOGRAPHIC MAPS

The current topography, as of March 14, 2003 of the Hardee County Landfill is depicted on Sheet 4 and 5 of the enclosed permit drawings. The landfill topography was mapped, by I.F. Rooks and Associates, using aerial photography methods on March 14, 2003.

The existing borrow area is shown on Sheet 3 of the enclosed permit drawings.

Access roads leading to the disposal area are shown on Sheet 10 for the Phase II Section I area and Sheet 13 for the Phase II Section II area of the enclosed permit drawings.

The grades required for proper drainage of the surface water management system will be constructed during the sequencing of the landfill. These grades, depicted on the sequencing plans, are shown on Sheets 10 and13 of the enclosed permit drawings. Stormwater management area improvements are shown on Sheet 8 of the enclosed permit drawings.

Cross sections of the lifts are shown on Sheets 16 and 17 of the enclosed permit drawings.

Fencing and the on-site equipment facilities are depicted on Sheet 3 of the permit drawings.

F.5 REPORT

F.5.a <u>Current and Projected Population and Area Served</u>

Current and future population estimates for Hardee County were obtained from the Florida Legislative Office of Economic and Demographic Research (FLOEDR). The population data from the FLOEDR for Hardee County in 2004 was estimated to 28,178. Projections were made by the FLOEDR through 2011. From 2011 through 2026, SCS used the rate of population increase, approximately 1.3 percent, to estimate the future population of Hardee County. Projections for the population to be served in the future is provided on Table F-1.

Mandatory collection for the municipalities and rural areas, the Hardee County Landfill services was instated for all of Hardee County in 2002. To estimate the landfill capacity remaining, the service area (only Hardee County) was assumed to remain constant throughout the period from 2004 through 2026.

TABLE F-1 SERVICE AREA POPULATION
HARDEE COUNTY LANDFILL
CONSTRUCTION PERMIT

YEAR	SERVICE AREA POPULATION
2004	28,178
2005	28.756
2006	29,270
2007	29,712
2008	30,111
2009	30,484
2010	30,866
2011	31,268

F.5.b Anticipated Type, Annual Quantity, and Source of Solid Waste

The Hardee County Landfill facility accepts municipal solid wastes (MSW), construction & demolition (C&D) debris, yard waste, and special wastes. Currently, only MSW and C&D debris are disposed of in the Class I landfill. MSW includes residential wastes, commercial wastes, and agricultural wastes. The majority of incoming wastes are baled prior to being landfilled in the Class I disposal area. Special wastes accepted by the facility include used oil (from residents only), waste tires, white goods, household hazardous wastes, lead-acid batteries, scrap metal, lawn mowers, appliances other than white goods, and electronics. Waste tires are ~~processed and~~ stored on site until a recycling contractor hauls the tires offsite. Yard waste is processed onsite and used for erosion control or distributed to residents. The facility does not accept hazardous waste. The facility does not accept biomedical waste with the exception of the collection and offsite disposal of medical sharps. These waste types will continue to be received throughout the next permit period.

Table F-2 shows the population and waste generation for the years 1996 through 2002. The 2002 quantity represents the tonnage received when mandatory collection was instated; therefore, the 2002 data point of 0.738 tons per year per capita is the only representative annual waste tonnage per capita point and would probably be the most representative value for future disposal estimates. The waste quantities reported by Hardee County Solid Waste Department for 2002 is contained in Attachment F-2.

Table F-3 presents future quantities of solid waste estimated to be disposed in the landfill based on the population estimates and future construction quantity estimates provided in Table F-1.

FLORIDA DEPARTMENT OF
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**TABLE F-2. 1996-2002 WASTE LOADING
HARDEE COUNTY LANDFILL
CONSTRUCTION PERMIT**

Year	Population[1]	Waste Disposed of in Class I Landfill (tons/yr)	Annual Waste Tonnage Per Capita	
1996	24,958	14,281.20	0.572	
1997	25,408	13,895.88	0.547	
1998	26,134	14,699.13	0.562	
1999	26,407	16,061.17	0.608	
2000	26,938	16,165.36	0.600	
2001	26,921	18,843.71	0.700	
2002	27,152	20,051.17	0.738	Mandatory collection started

TONS PER CAPITA[2] 0.738

	Existing Cell[3]	Expansion Cell[4]	Expansion Cell[8]	
Gross Airspace Available =	190,000	172,240	744,513	CY
Estimated Percent Cover =	10%	10%	10%	
Airspace for Cover =	19,000	17,224	74,451	CY
Net Airspace available =	171,000	155,016	670,062	CY
Waste Density[5] =	43	43	43	lb/CF

F.5.c <u>Anticipated Facility Life</u>

For estimating the disposal capacity and life of site, the proposed final buildout, shown on the permit drawings, were compared to the March 2003 topographic map to determine the available airspace. SCS estimated that 10% of that airspace would be used for cover material. Airspace calculation are contained in Attachment F-3. The following airspace estimates were computed for each of the disposal phases;

- The Phase I Final buildout (to intermediate cover grades), the gross available airspace is approximately 190,000 cubic yards (CY);
- The Phase II Section I buildout to elevation 110 is approximately 172,240 CY.
- The Phase II Section II Final Site Buildout to elevation 157.5 is approximately 670,062 CY.

SCS used an estimated in-place density for the waste material for volume calculations of approximately 43 pounds per cubic foot (pcf) or approximately 1100 pounds per cubic yard. A heavier in-place density of 60 pcf (accounting for moisture that infiltrates into the bales and cover soils) was used in the geotechnical analysis for the expansion) Refer to Section J of this permit application for the geotechnical analysis. This density is consistent with waste density for landfills using dozers for compaction. Table F-3 represents the available and consumed airspace on a yearly basis. The consumed airspace was estimated by converting the annual waste disposal quantity into pounds per year and dividing by the estimated in-place waste density.

As shown in Table F-3, the available airspace the following site life estimated were computed;

- The airspace in Phase I will be consumed late 2006.
- The airspace in Phase II Section I, which will start receiving waste in early 2007, and within five years, late in 2011 Prior to reaching Elevation 110, construction will begin on Phase II Section II to complete the full 10 acre expansion area.
- The airspace in Phase II Section II expansion area will be consumed by early 2026.

F.5.d <u>Source and Type of Cover Material</u>

Cover material soils are obtained from either the on-site borrow pit or from an off-site County borrow pit.

Based on previous soil borings and soil data from the <u>Soil Survey of Hardee County, Florida</u>, USDA Soil Conservation Service, the excavation borrow pit consists of poorly graded sands to a depth of five to fifteen feet. Clayey sands and clays are found at lower depths.

TABLE F-3 WASTE LOAD PROJECTIONS
HARDEE COUNTY LANDFILL
CONSTRUCTION PERMIT

YEAR	POPULATION[1]	WASTE DISPOSED OF IN CLASS I LANDFILL (tons/yr)[7]	AIRSPACE CONSUMED (CY)	PHASE I AIRSPACE (CY)	PHASE II SECTION I AIRSPACE (CY)	PHASE II SECTION II AIRSPACE (CY)	
March 2003[6]	20,705	15,290	26,340	144,660	--	--	
2004	28,178	20,809	35,846	108,814	--	--	
2005	28,756	21,236	36,582	72,232	--	--	
2006	29,270	21,615	37,236	34,996	155,016	--	
2007	29,712	21,942	37,798	-2,802	152,214	--	Phase I complete
2008	30,111	22,236	38,305		113,909	--	
2009	30,484	22,512	38,780		75,129	--	
2010	30,866	22,794	39,266		35,863	670,062	
2011	31,268	23,091	39,777		-3,914	666,147	Phase II Section I complete
2012	31,675	23,391	40,295			625,852	
2013	32,088	23,696	40,820			585,032	
2014	32,506	24,005	41,352			543,680	
2015	32,929	24,317	41,890			501,789	
2016	33,358	24,634	42,436			459,353	
2017	33,792	24,955	42,989			416,365	
2018	34,232	25,280	43,549			372,816	
2019	34,678	25,609	44,116			328,700	
2020	35,130	25,943	44,690			284,010	
2021	35,588	26,281	45,272			238,738	
2022	36,051	26,623	45,862			192,876	
2023	36,521	26,970	46,459			146,416	
2024	36,996	27,321	47,064			99,352	
2025	37,478	27,677	47,677			51,675	
2026	37,966	28,037	48,298			3,376	Phase II Section II complete
2027	38,461	28,402	48,927			-45,551	

CONCLUSION

Phase I consumes the available volume by November of 2007.
Phase II Section I begins filling in November of 2007; Phase II volume is consumed by October of 2011.

1. Source : Florida Legislative Office of Economic and Demographic Research
2. The 2002 quantity represents the tonnage received when mandatory collection was instated; therefore, the 2002 data point is the only representative annual waste tonnage per capita point.
3. Airspace computed using March 2003 topography versus the permitted final buildout of the existing landfill. Final buildout permitted February 2004.
4. Volume available at the start of 2006, when construction of new cell is completed.
5. Waste density based upon average bale weight (2150 lb)/(bale size 2.6' x 3.8' x 5.1')
6. March 2003 represents the date of the topographic survey. One-quarter of the waste for 2003 was already in place; this row reflects this data (i.e. the population was reduced by one-quarter).
7. Waste quantity disposed in landfill (loose and baled) provided by Hardee County.
8. Estimated Airspace volume from Phase II Section I to Phase II Section II

Daily and intermediate cover soil should be well draining sandy soils, typical USCS soils are SW, SP, and SP-SM soil types. Slightly clayey (SC) and low plasticity clays (CL) are only recommended for use as intermediate cover on the outside slopes

F.6 WATER QUALITY LABORATORY REQUIREMENTS

All water quality sampling shall be conducted in accordance with the Department's Standard Operating Procedures and all sample analyses will~~and testing for the Hardee County Landfill~~ be conducted by a firm that is certified by the Florida Department of Health's Environmental Laboratory Certification Program. Currently all sampling and laboratory analyses is ~~being~~ conducted by Short Environmental Laboratories, Inc. The laboratory is certified by the Florida Department of Health's Environmental Laboratory Certification Program.~~authorized under FDEP CompQAP #880516.~~

F.7 CLOSURE AND LONG TERM CARE FINANCIAL RESPONSIBILITY

Financial responsibility information is discussed in Section S of this report.

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

ATTACHMENT F-1

ZONING MAP

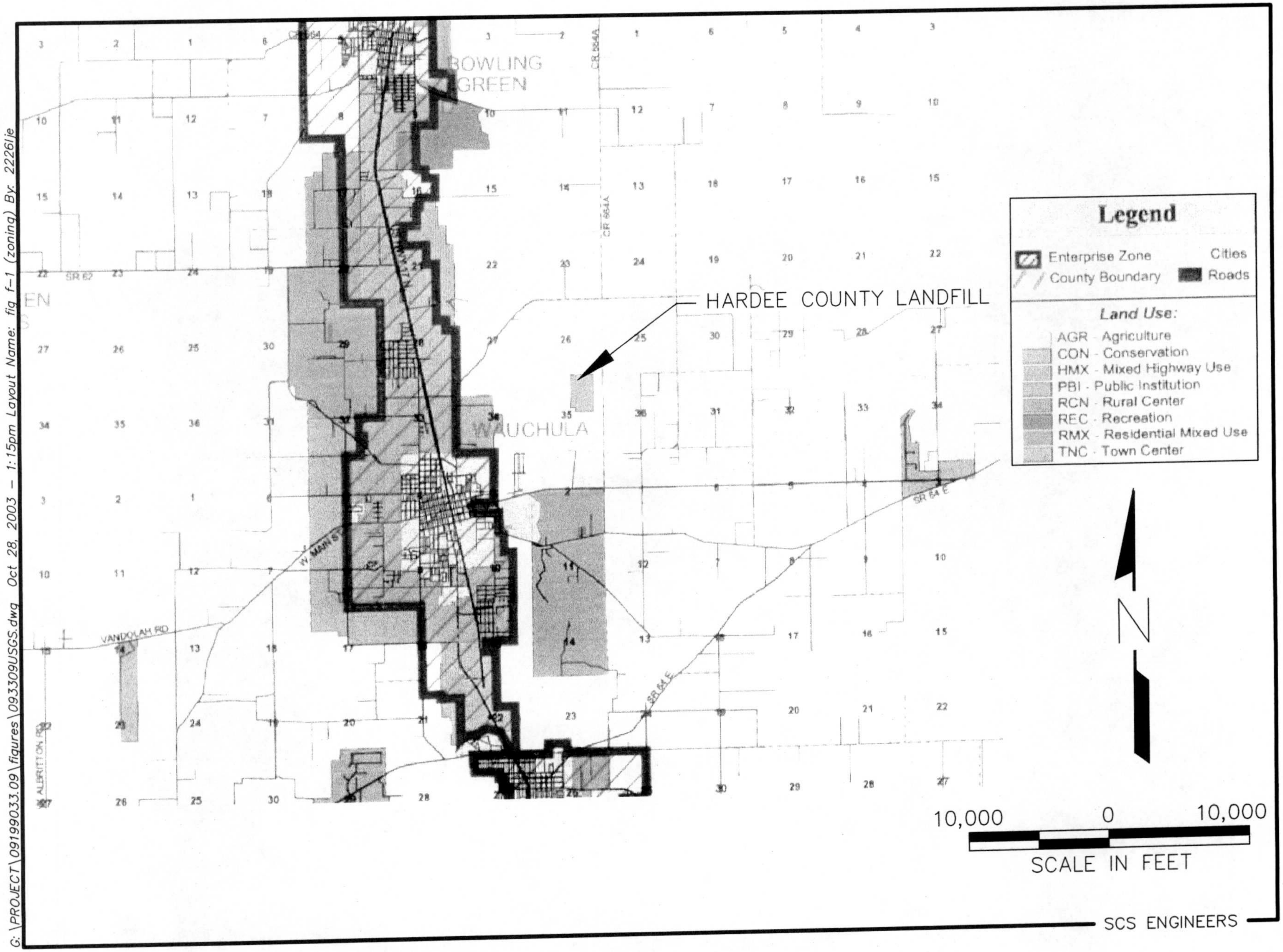

Figure F-1. Zoning Map, Hardee County Landfill

ATTACHMENT F-2

2002 WASTE QUANTITIES

WASTE QUANTITY REPORT 2002

	RESIDENTIAL (tons)	COMMERCIAL (tons)	C&D DEBRIS (tons)	WOOD & YARD WASTE (tons)	SCRAP METAL (tons)	TIRES (tons)	TOTAL TONNAGE
Jan-02	739.30	688.17	472.95	100.51		7.32	2,008.25
Feb-02	685.10	629.85	316.25	166.50		7.66	1,805.36
Mar-02	689.85	621.37	903.55	179.72	55.27	10.20	2,459.96
Apr-02	744.58	663.16	454.65	150.87	44.13	9.80	2,067.19
May-02	798.65	602.78	281.22	67.67	44.47	11.85	1,806.64
Jun-02	816.20	537.28	279.13	124.63	11.64	12.90	1,781.78
Jul-02	762.11	511.68	286.83	158.15	46.21	12.96	1,777.94
Aug-02	662.28	545.70	259.59	103.65	51.87	7.90	1,630.99
Sep-02	669.19	453.88	303.10	79.40	50.53	10.42	1,566.52
Oct-02	734.35	537.39	232.32	98.15	39.36	15.97	1,657.54
Nov-02	740.83	631.19	189.37	67.10	66.98	10.07	1,705.54
Dec-02	869.09	723.66	88.63	67.93	48.58	7.67	1,805.56
TOTAL	8,911.53	7,146.11	4,067.59	1,364.28	459.04	124.72	22,073.27

	PROCESSED THROUGH MRF (tons)	MRF BYPASS (tons)	DISPOSED IN CLASS I[1] (tons)	RECYCLED THROUGH MRF (tons)	SCRAP METAL RECYCLED (tons)	WOOD/YARD WASTE PROCESSED (tons)	WASTE TIRES REMOVED FOR RECYCLING (tons)
Jan-02	1,030.08	870.34	1,892.27	8.15	0.00	0.00	6.27
Feb-02	685.01	946.19	1,618.07	13.13	0.00	757.22	7.52
Mar-02	1,058.19	1,156.58	2,191.82	22.95	291.08	0.00	6.10
Apr-02	495.03	1,367.36	1,851.21	11.18	0.00	0.00	6.29
May-02	5.08	1,677.57	1,682.65	0.00	0.00	0.00	14.85
Jun-02	0.00	1,632.61	1,629.47	3.14	0.00	0.00	10.18
Jul-02	0.00	1,560.62	1,559.28	1.34	0.00	0.00	11.24
Aug-02	0.00	1,467.57	1,467.57	0.00	0.00	819.55	2.87
Sep-02	732.11	694.06	1,426.17	0.00	0.00	0.00	17.10
Oct-02	888.13	615.93	1,502.81	1.25	276.74	0.00	7.88
Nov-02	1,139.30	422.09	1,561.39	0.00	0.00	0.00	19.10
Dec-02	1,256.11	425.27	1,668.46	12.92	0.00	0.00	7.31
TOTAL	7,289.04	12,836.19	20,051.17	74.06	567.82	1,576.77	116.71

[1] Disposed in Class I Total = Residential + Commercial + C&D - Recycled in MRF

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ATTACHMENT F-3

AIRSPACE CALCULATIONS

SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Operations Renewal	09199033.08

SUBJECT	BY	DATE
Site Life Estimate	LEK	2/24/2004
	CHECKED	DATE

YEAR	POPULATION[1]	WASTE DISPOSED OF IN CLASS I LANDFILL (tons/yr)	ANNUAL WASTE TONNAGE PER CAPITA
1996	24,958	14,281.20	0.572
1997	25,408	13,895.88	0.547
1998	26,134	14,699.13	0.562
1999	26,407	16,061.17	0.608
2000	26,938	16,165.36	0.600
2001	26,921	18,843.71	0.700
2002	27,152	20,051.17	0.738

Mandatory collection started

TONS PER CAPITA[2]: 0.738

	Existing Cell[3]	Expansion Cell[4]	Expansion Cell[8]	
Gross Airspace Available =	190,000	172,240	744,513	CY
Estimated Percent Cover =	10%	10%	10%	
Airspace for Cover =	19,000	17,224	74,451	CY
Net Airspace available =	171,000	155,016	670,062	CY
Waste Density[5] =	43	43	43	lb/CF

YEAR	POPULATION[1]	WASTE DISPOSED OF IN CLASS I LANDFILL (tons/yr)[7]	AIRSPACE CONSUMED (CY)	PHASE I AIRSPACE (CY)	PHASE II SECTION I AIRSPACE (CY)	PHASE II SECTION II AIRSPACE (CY)	
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2005	28,756	21,236	36,582	72,232	--	--	
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2008	30,111	22,236	38,305		113,909	--	
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2010	30,866	22,794	39,266		35,863	670,062	
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2012	31,675	23,391	40,295			625,852	
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2020	35,130	25,943	44,690			284,010	
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2023	36,521	26,970	46,459			146,416	
2024	36,996	27,321	47,064			99,352	
2025	37,478	27,677	47,677			51,675	
2026	37,966	28,037	48,298			3,376	Phase II Section II
2027	38,461	28,402	48,927			-45,551	complete

CONCLUSION

Phase I consumes the available volume by November of 2007.

Phase II Section I begins filling in November of 2007; Phase II volume is consumed by October of 2011.

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6. March 2003 represents the date of the topographic survey. One-quarter of the waste for 2003 was already in place; this row reflects this data (i.e. the population was reduced by one-quarter).
7. Waste quantity disposed in landfill (loose and baled) provided by Hardee County.
8. Estimated Airspace volume from Phase II Section I to Phase II Section II

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County	PROJECT Hardee County Expansion		JOB NO. 09199033.09
SUBJECT Estimated Site Life Per Phase II Sections I & II		BY JHO	DATE
		CHECKED	DATE

GIVEN: Volumes from AutoCAD

Total Airspace (Intermediate Cover) to Exist March 2003 and Bottom Expansion of both Phase II Section I & II

1,106,753 cy

Total Airspace (Intermediate Cover) of Exist Phase I Buildout 190,000 cy

∴ Therefore Airspace from Phase I Buildout to Phase II Buildout

⇒ 1,106,753 − 190,000

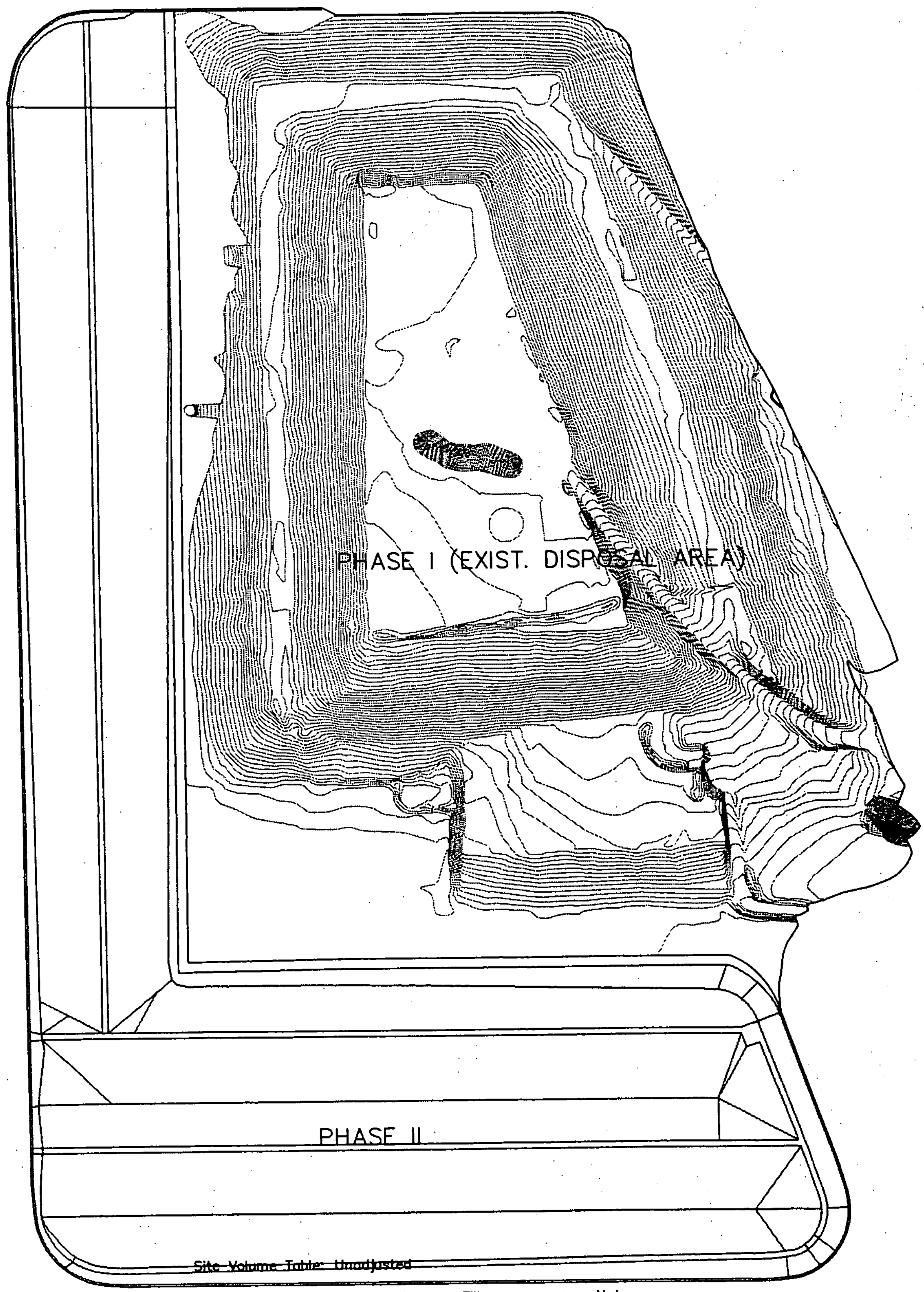
→ 916,753 cy Total Phase II

Estimate Airspace for Phase II Section I is 172,240 cy

∴ Therefore Airspace from Phase II Section I to Phase II Section II is

916,753 cy
172,240 cy
744,513 cy

Phase II Section II



~~Site Volume Table: Unadjusted~~

Site	Stratum	Surf1	Surf2	Cut yards	Fill yards	Net yards	Method
Phase II Buildout							
	title v	title v --bottom phase ii	title v -- final surface	312	1107066	1106753 (F)	Grid

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Figure 1 – Title V – Airspace Volume Estimate (Bottom of Phase II)
Hardee County Landfill, Hardee County, Florida

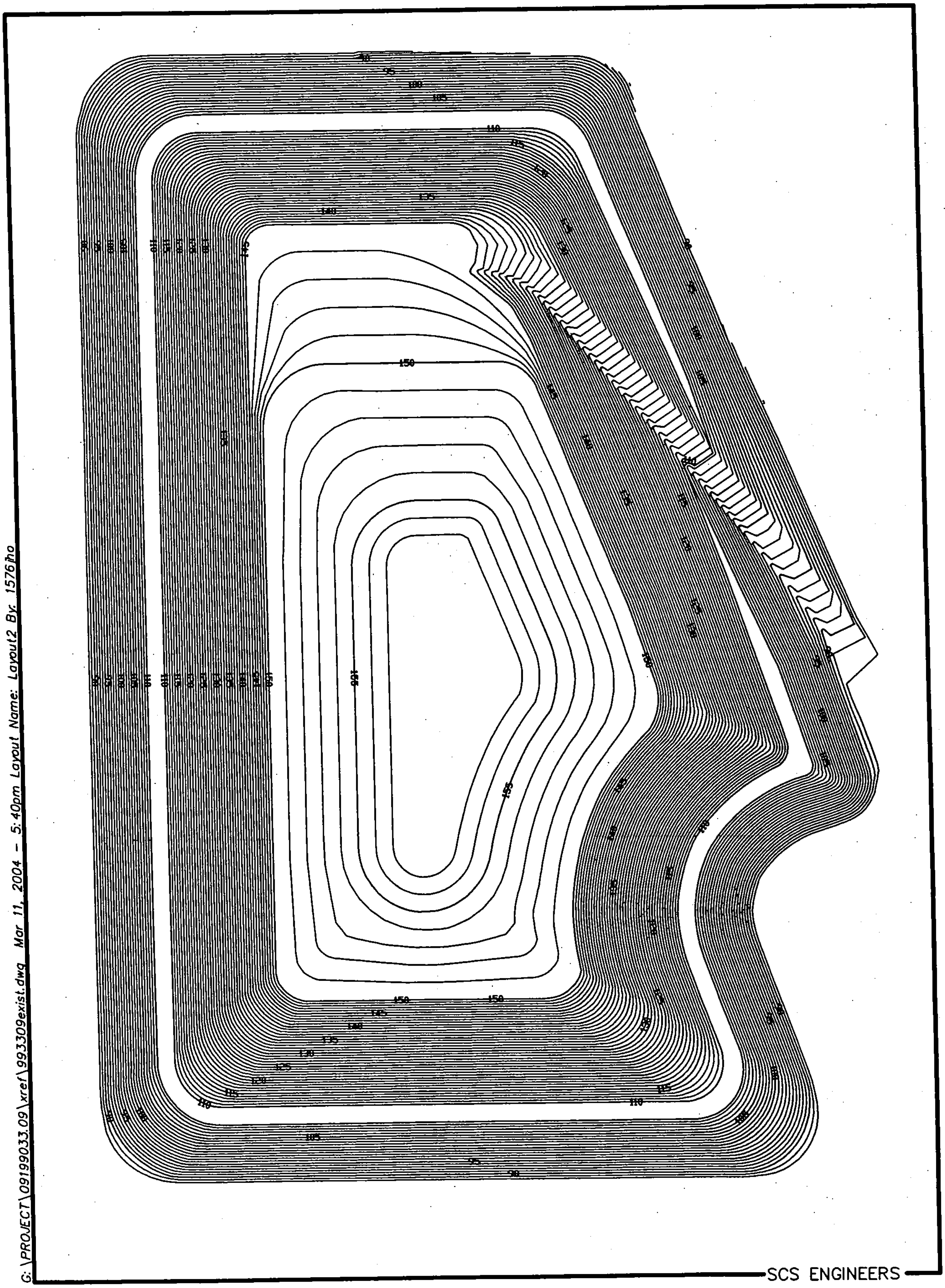
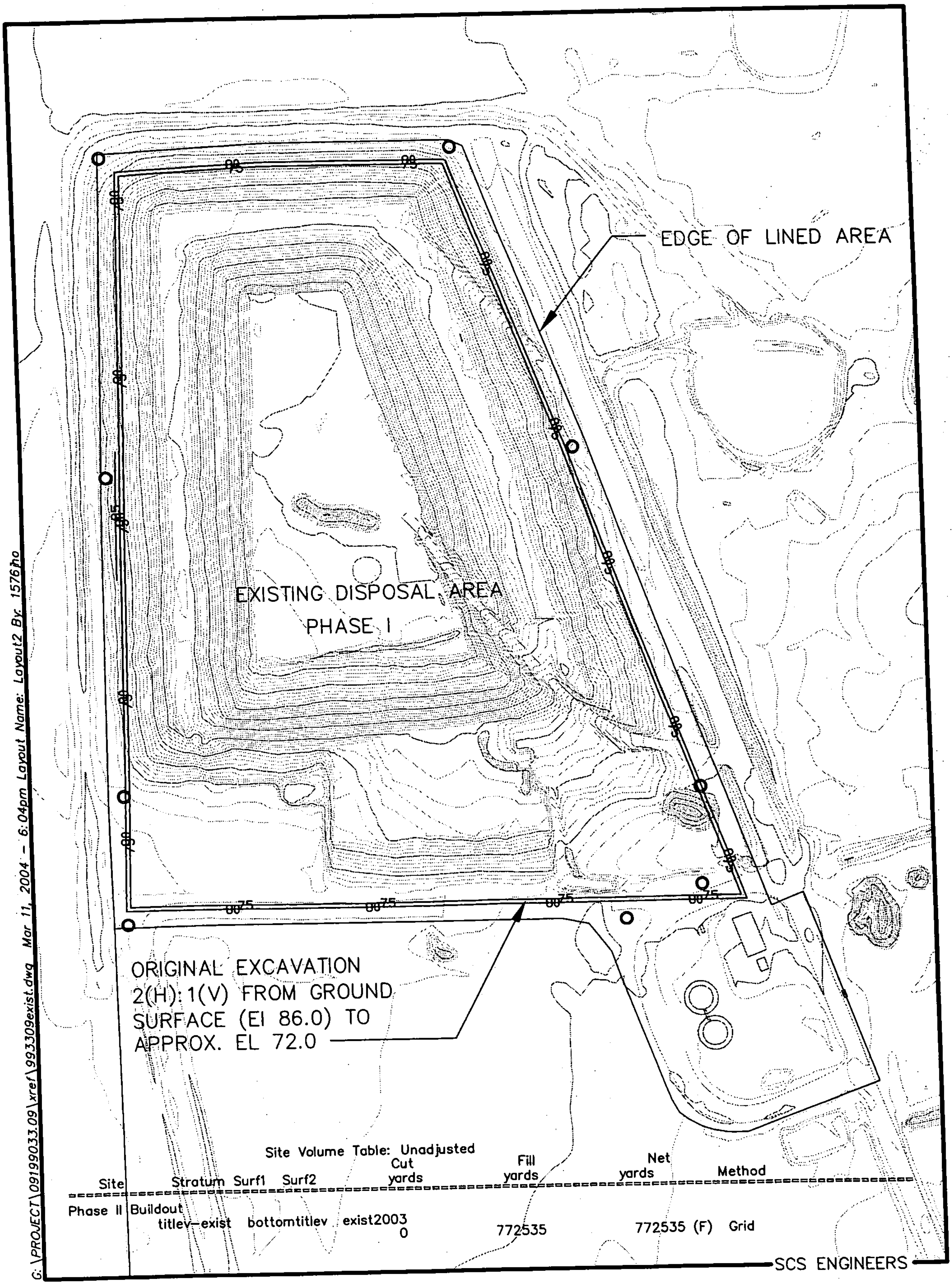


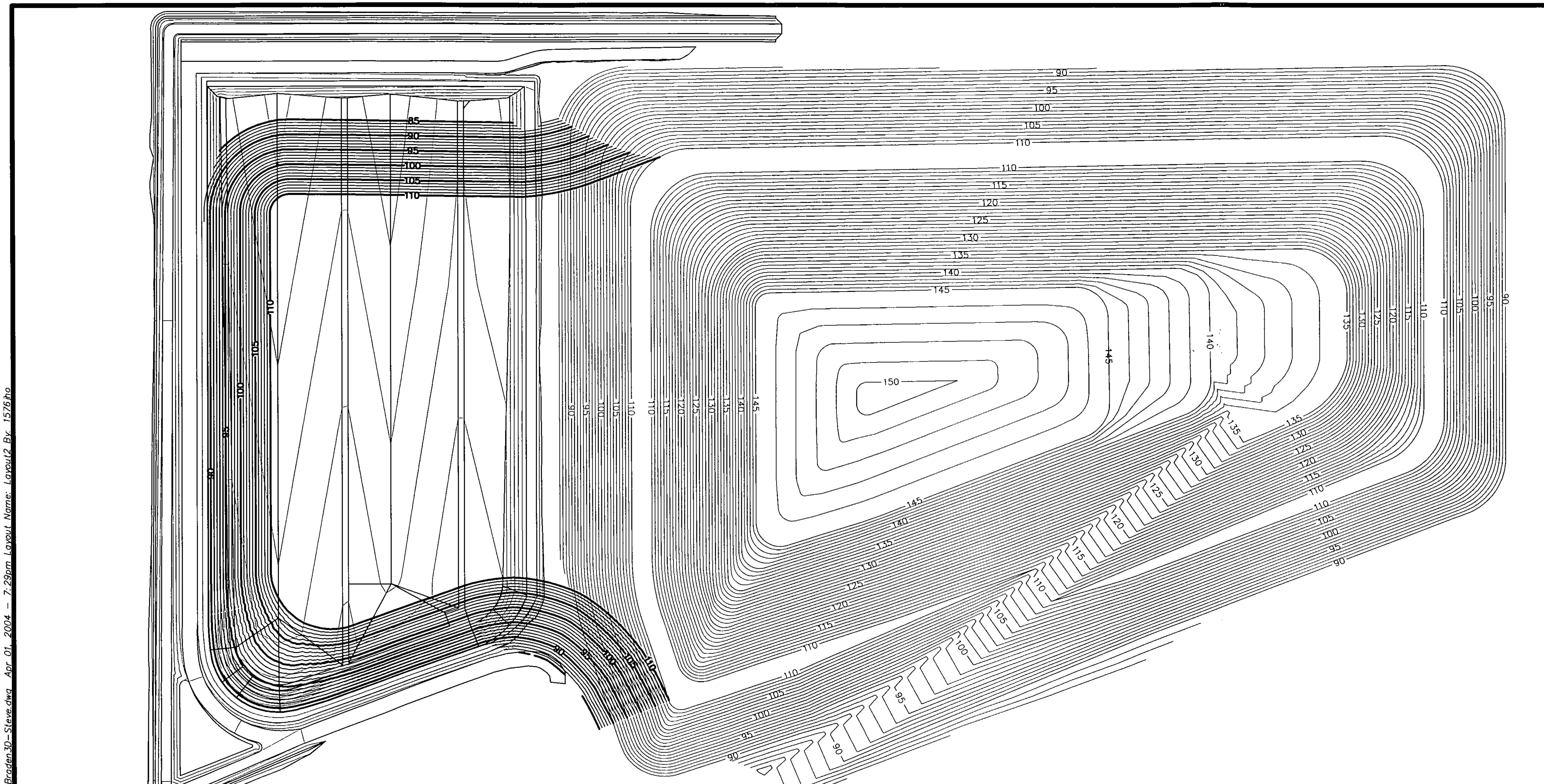
Figure 2 – Title V – Airspace Volume Estimate (Final Phase II)
Hardee County Landfill, Hardee County, Florida



Site Volume Table: Unadjusted

Site	Stratum	Surf1	Surf2	Cut yards	Fill yards	Net yards	Method
Phase II	Buildout titlev-exist	bottomtitlev	exist2003	0	772535	772535 (F)	Grid

Figure 3 – Title V – Airspace Volume Estimate (Phase I Inplace Waste)
Hardee County Landfill, Hardee County, Florida



Site Volume Table: Unadjusted

Site	Stratum	Surf1	Surf2	Cut yards	Fill yards	Net yards	Method
P2S1toEL110	exist9903_p2s1tos-p2s1to110			0	172240	172240 (F)	Grid
	existbuild-9-9-03withp2s1top ofsand p2s1-buildoutto110			0	172332	172331 (F)	Composite

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SCS ENGINEERS

Figure 4 – Buildout of Phase II Section I to Elevation 110.0

SECTION G

GENERAL CRITERIA FOR LANDFILLS

G.1 LOCATION IN 100-YEAR FLOOD PLAIN

Figure G-1, located in Attachment G-1 contains the Flood Insurance Rate Map (FIRM Map Panel No. 12049CO185C, May 1988) for Hardee County. The map shows the location of the landfill site with respect to the flood zone designation for the Landfill and surrounding area. The Landfill and the surrounding areas are designated Flood Zone "X" which is outside of the anticipated 500-year flood zone. Therefore, the site is also located outside of the 100-year floodplain.

G.2 MINIMUM HORIZONTAL SEPARATION

The County has recently acquired additional parcels of land, specifically a parcel of land approximately 250 feet to the west and a parcel of land approximately 100 feet to the north of the previously property limits. Refer to Section E Attachment E-3 for the additional property limits and Sheet 14 of the enclosed permit drawings.

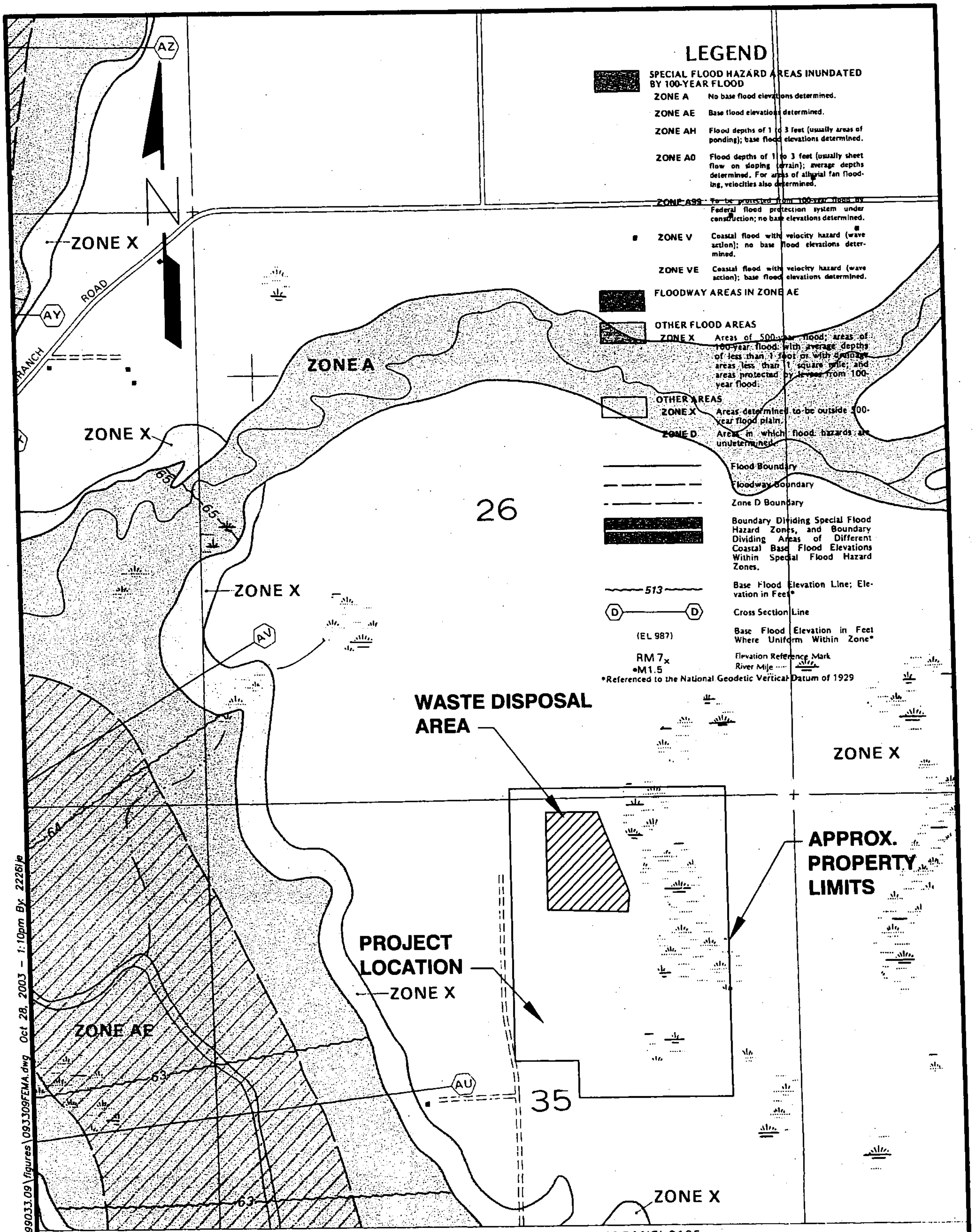
The additional parcels of land allow for the required 100-foot separation from the property limit and the toe of the proposed final cover slope of the Phase II, Section I and II,(reference Chapter 62-701.340 (4)c.) on all sides of expansion area.

G.3 LANDFILL SCREENING

The Hardee County Landfill is located in a remote area, approximately one mile north of State Road 636. The Class I landfill disposal area, both Phase I and Phase II, are located in the northeast corner of the property. Several isolated residential homes are located to the east and south of the property. Natural vegetation exists along the eastern and southern sides of the property. No residential homes or roads are located to the west and north of the property, only pastures, Therefore no screening is required along the northern and western sides of the property.

ATTACHMENT G-1

FLOOD INSURANCE RATE MAP



SCALE: NTS

SOURCE: NATIONAL FLOOD INSURANCE PROGRAM MAP PANEL NO. 12049 C0185C, 5/4/88

SCS ENGINEERS

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Figure G-1. Flood Insurance Rate Map, Hardee County Landfill
Hardee County, Florida.

SECTION H

LANDFILL CONSTRUCTION REQUIREMENTS

H.1 FILL SEQUENCE PLAN

General

This permit application is for the construction of the bottom-lined area of the Phase II Section I and II expansion area. Prior to operation of the new area, a request for a modification to the landfill's Operation Permit, including the operational fill sequence plan to show a detailed fill sequence plan for the filling of the Phase II area, will be prepared and submitted to FDEP.

Generally, the filling of the Phase II area will begin on the eastside of the Phase II Section I disposal area. The filling will proceed by placing waste against the eastern sideslope of the expansion area and proceed northward. The first lift (approximately 10 feet) across the entire Phase II Section I will bring the disposal area slightly above the proposed perimeter road. This will allow for runoff of stormwater and decrease leachate generation. Once above grade, the waste material will be placed against the toe of the slope of the existing waste material on the south end of Phase I. Filling will then along the toe of slope in a east to west direction. Filling will continue southward, until the entire Phase I Section I area is raised to approximately Elevation 110.

Then Phase II Section II will be constructed and available for waste disposal. Filling of the Phase II Section II area will begin on the southside and proceed toward the north, eventually raising the entire Phase II Section II area to Elevation 110. Waste will then be placed along the sideslope of the Phase I disposal area. Filling will proceed by filling against the sideslope of the Phase I disposal area and then raising the Phase II disposal area up. Final filling will achieve the grades shown on the permit drawings.

Maximum Landfill Height

The maximum operational fill height of the landfill (top of intermediate cover) is Elevation 157.5 ft. NGVD. A two protective soil cover cap (assuming that 12 inches of the intermediate cover is clean fill and can be used as a bedding layer) would raise the final closure cap elevation of the Phase I and II disposal area to Elevation 159.5 ft. NGVD.

H.2 BOTTOM LINER DESIGN

H.2.a Liner Requirements

The proposed design of the Phase II Section I and II cell lining system will be as follows and as detailed in the design drawings. From top to bottom:

- A 2-foot thick layer of protective sand to provide leachate drainage and to protect the underlying liner system.
- Double-sided, bi-planar geocomposite drainage layer
- 60-mil High Density Polyethylene (HDPE) geomembrane, textured
- Double-sided, tri-planar geocomposite drainage layer
- 60-mil HDPE geomembrane, textured
- 6 inch sub-base with a maximum hydraulic conductivity of $1x10^{-5}$ cm/sec

H.2.a.1 Liner Material Properties--

The bottom liner for the expansion area will meet the liner design requirements specified by Rule 62-701.400(3)(c), FAC for double liner systems.

All construction documentation and test results, including Record Documents reflecting as-built conditions, will be submitted to FDEP upon completion of construction. The construction certification report submitted for FDEP approval will include:

- Construction Quality Assurance (CQA) monitoring of sub-base preparation, placement and testing.
- Geomembrane Manufacturer's Quality Control (MQC) certificates, CQA monitoring data, seam test results, geomembrane panel layout plan, and topography maps for the geomembrane.
- Construction of the leachate collection and removal system, including MQC certificates from the pipe manufacturer, and permeability tests on the drainage sand.
- The test information, which will be provided to the FDEP, will verify that materials are in accordance with the specifications provided by ASTM and GRI.

The test information, which will be provided to FDEP, for the geomembrane will consist of manufacturer's QC certificates, which verify that the geomembrane was constructed of materials in accordance with the specifications presented in Attachment H-1. Geomembrane tests will include:

- Sheet thickness.
- Sheet tensile properties.
- High Density Polyethylene (HDPE) content.
- Carbon black content and dispersion.
- Seam strength.

Liner protective measures will be part of the liner specifications as it relates to resin quality and manufacturers liner testing performance, design of the liner system, operation of the cell, and field construction liner quality assurance controls.

- Liner Resin Specifications: The specifications for the geomembrane liner will include the recommendations from the Geosynthetic Research Institute (GRI) and requirements of the ASTM standards for meeting resin material formulation and testing criteria that will ensure satisfactory performance.

- Liner CQA Controls: The County will be advised to retain qualified personnel who will be responsible for conducting construction quality control measures and inspections for the materials, installation, seaming, and testing of the geomembrane liners.

H.2.a.2 Foundation--

The foundation of the landfill expansion is addressed in Section J of this report.

H.2.a.3 Bottom Liner Location Relative to Seasonal High Groundwater--

The bottom liner system in relation to the seasonal high groundwater table is addressed in Section J of this document.

H.2.a.4 Hydrostatic Uplift--

The bottom liner system in relation to the seasonal high groundwater table is addressed in Section J of this document. The expansion area will have a groundwater collection system installed to collect groundwater levels above the seasonal high groundwater table elevations recorded for the expansion area. The geomembrane will not be under the groundwater table, therefore the bottom liner system will not be influenced by hydrostatic uplift.

H.2.a.5 Operations--

Waste will not be placed beyond the horizontal extent of the liner. The limits of the lining system will be easily visible in the field at all leading edges including the anchor trenches along the west, north and south sides. Maintaining the waste within the limits of liner prevents municipal solid waste and leachate from coming into contact with any exposed soil.

H.2.b <u>Composite Liner (Not Applicable)</u>

The expansion has a double liner system; therefore, this section of the application is not applicable.

H.2.c Double Liners

H.2.c.1 Liner Material Properties--

The properties for the upper and lower HDPE remembrances are described in the technical specifications for the liner system, which are presented in Attachment H-1. The geomembrane liner will be nominal 60 mils thick and textured.

H.2.c.2 Hydraulic Head Limitations--

The leachate collection and removal system is designed to meet the FDEP requirements for limiting the leachate head to less than one foot above the geomembrane during routine landfill operations as per 62-701.400(3)(c)(1), FAC.

To calculate the anticipated rate of leachate generation, a water balance was initially performed using the United States Environmental Protection Agency's (U.S. EPA) Hydrological Evaluation of Landfill Performance (HELP) computer model version 3.07, 1994. Precipitation falling on a landfill surface will run off, evaporate, evapotranspirate, or infiltrate. The percentage of precipitation falling on a landfill surface that will travel each of these paths can be estimated by use of water balance methods.

The HELP model uses various formulas based upon fundamentals of soil mechanics to simulate water percolation in a vertical and horizontal direction under many climatological, soil, and topographic conditions. The model estimates how much leachate and surface drainage is likely to occur after a certain period of time within a landfill profile.

Hydrological Data

Precipitation data from Wauchula, Florida was used within the HELP model. Precipitation data was obtained from the U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA) National Weather Service. The NOAA weather station is located in Wauchula, Florida; the station index number is 08-9401-04. The average monthly rainfall data for Wauchula was inserted in the monthly precipitation file of the HELP model.

The NOAA data shows that the year of 1998 represents the year with the greatest amount of rainfall. The daily rainfall values for 1998 were input into the model in year 20; this year represents the default year with the greatest amount of rainfall. The NOAA rainfall data is located in Attachment H-4.

Geocomposite Selection

In order to keep the maximum head above the geomembrane liner within the geonet thickness, a certain transmissivity must be achieved from the geocomposite. The transmissivity calculations located in Attachment H-5 are for bi-planar and tri-planar geocomposites. Appropriate reduction factors have been applied to the transmissivity values; these reduction factors represent chemical clogging, biological clogging, geotextile intrusion, creep reduction, and a factor of safety.

- Chemical and biological reduction factors account for the particles that fill the voids in the geotextile; over time, the chemical and biological clogging reduces the transmissivity of the geocomposite. The chemical and biological reduction factors have been obtained from the Geosynthetic Research Institute (GRI) Standard-GC8. The primary and secondary system has differing chemical and biological clogging factors.

- Geotextile intrusion accounts for the geotextile encroaching on the geonet under a constant load. A 100-hour transmissivity test factors into intrusion. After the 100-hour seat time, the geotextile has already begun to intrude into the geonet; therefore, the transmissivity value has already been affected by the intrusion factor. The intrusion factor used in the calculations is 1.0 because the transmissivity values were based on the 100-hour seat time.

- Creep reduction represents the elongation of the geonet under constant load for an extended period of time. Typical creep reduction factors have been supplied by bi-planar and tri-planar geocomposite manufacturers.

- The transmissivity is also divided by a factor of safety of two.

The HELP Model requires a hydraulic conductivity input for the geocomposite layer. Hydraulic conductivity is determined by dividing the transmissivity by the thickness of the geocomposite. The geocomposite calculations are located in Attachment H-5.

Based on the geocomposite calculations and HELP model, a bi-planar geocomposite can be used for the primary leachate collection system. Per 62-701.400(3)(c)(2), FAC, the secondary leachate collection system shall have a minimum hydraulic conductivity of ten centimeters per second (cm/sec). A tri-planar geocomposite can achieve this hydraulic conductivity after accounting for all the reduction factors and while keeping the maximum head within the geocomposite thickness in the secondary system.

Design Cases

The HELP model was used to determine leachate quantities for several anticipated operating (waste filling) conditions. The following HELP Model cases represent the varying operating conditions.

- *Case 1:* The waste cell has just begun accepting waste; therefore, waste placement is at a minimum. The waste depth is 0 feet over the protective sand layer across the entire bottom of the cell. Since the landfill cell does not contain waste, reduction factors have not been applied to the transmissivity. Case 1 has three HELP model runs to represent the varying slopes and slope lengths within the bottom of the cell.

- *Case 2:* The proposed waste height is approximately 10 feet over the protective sand layer across the entire bottom of the cell. Since the cell has 10 feet of waste, reduction factors have been applied to the transmissivity. The reduction factors are as follows:

  - Bi-planar Geocomposite (leachate collection system)

    - $RF_{chemical\ clogging} = 2.0$
    - $RF_{biological\ clogging} = 1.3$
    - $RF_{intrusion} = 1.0$
    - $RF_{creep} = 1.02$

    - Factor of Safety = 2.0

  - Tri-planar Geocomposite (leachate detection system)

    - $RF_{chemical\ clogging} = 1.5$
    - $RF_{biological\ clogging} = 1.3$
    - $RF_{intrusion} = 1.0$
    - $RF_{creep} = 1.2$
    - Factor of Safety = 2.0

  Case 2 has four HELP model runs to represent the varying slopes within the bottom of the cell. These slopes differ from the slopes within Case 1 due to landfill settlement.

- *Case 3:* The proposed waste thickness is increased to 40 feet over the protective sand layer across the entire bottom of the cell. The reduction factors listed above have been applied to the transmissivity, with the exception of the creep factor for the bi-planar material. A creep reduction factor of 1.1 was used for the bi-planar material to account for a heavier load; the creep reduction factor of 1.1 corresponds to a load of 5000 psf, which covers the 40-ft and 69.5 ft loading.

  Since the slope length of 77.3 feet with a 2.14% slope was the most conservative HELP model run for Case 2 (meaning the head on the liner was greatest), this length and slope was used for Case 3.

- *Case 4:* The proposed waste thickness is increased to 69.5 feet (a corresponding elevation of 155) over the protective sand layer across the entire bottom of the cell. The reduction factors listed above have been applied to the transmissivity. Since the slope length of 77.3 feet with a 2.14% slope was the most conservative HELP model run for Case 2 (meaning the head on the liner was greatest), this length and slope was used for Case 4.

See Attachment H-6 for the HELP model runs and results.

HELP Model Inputs

The HELP Model allows the user to input soil, waste, or material types in order to simulate the leachate percolation through the landfill. Input data are as follows for each case:

	Thickness (inches)	Soil Texture Number	USDA Soil Texture Description	Hydraulic Conductivity (cm/sec)	Comments
Case 1, Waste Depth = 0 ft					
Protective Sand Layer	24	5	Fine Sandy Loam	1.0×10^{-3}	
Bi-planar Geocomposite	0.30			17.7	
60-mil Textured Liner	0.06	35	HDPE Membrane	2.0×10^{-13}	1 pinhole/acre (per EPA HELP Model Guide)
Tri-planar Geocomposite	0.30			26.2	
60-mil Textured Liner	0.06	35	HDPE Membrane	2.0×10^{-13}	1 pinhole/acre (per EPA HELP Model Guide)
Clay Barrier	6	22	Loam	1.9×10^{-5}	
Case 2, Waste Depth = 10 ft					
Daily Cover	6	5	Fine Sandy Loam	1.0×10^{-3}	
Waste Layer	24	19	Municipal Waste w/ Channeling	1.0×10^{-3}	
Waste Layer	48	19	Municipal Waste w/ Channeling	1.0×10^{-3}	
Waste Layer	48	19	Municipal Waste w/ Channeling	1.0×10^{-3}	
Protective Sand Layer	24	5	Fine Sandy Loam	1.0×10^{-3}	
Bi-planar Geocomposite	0.29			6.8	Reduced transmissivity/hydraulic conductivity
60-mil Textured Liner	0.06	35	HDPE Membrane	2.0×10^{-13}	1 pinhole/acre (per EPA HELP Model Guide)
Tri-planar Gecomposite	0.25			13.4	Reduced transmissivity/hydraulic conductivity
60-mil Textured Liner	0.06	35	HDPE Membrane	2.0×10^{-13}	1 pinhole/acre (per EPA HELP Model Guide)
Clay Barrier	6	22	Loam	1.9×10^{-5}	
Case 3, Waste Depth = 40 ft					
Daily Cover	6	5	Fine Sandy Loam	1.0×10^{-3}	
Waste Layer	72	19	Municipal Waste w/ Channeling	1.0×10^{-3}	
Waste Layer	240	19	Municipal Waste w/ Channeling	1.0×10^{-3}	

	Thickness (inches)	Soil Texture Number	USDA Soil Texture Description	Hydraulic Conductivity (cm/sec)	Comments
Waste Layer	120	19	Municipal Waste w/ Channeling	$1.0x10^{-3}$	
Waste Layer	48	19	Municipal Waste w/ Channeling	$1.0x10^{-3}$	
Protective Sand Layer	24	5	Fine Sandy Loam	$1.0x10^{-3}$	
Bi-planar Geocomposite	0.27			6.8	Reduced transmissivity/hydraulic conductivity
60-mil Textured Liner	0.06	35	HDPE Membrane	$2.0x10^{-13}$	1 pinhole/acre (per EPA HELP Model Guide)
Tri-planar Geocomposite	0.25			13.4	Reduced transmissivity/hydraulic conductivity
60-mil Textured Liner	0.06	35	HDPE Membrane	$2.0x10^{-13}$	1 pinhole/acre (per EPA HELP Model Guide)
Clay Barrier	6	22	Loam	$1.9x10^{-5}$	
Case 4, Waste Depth = 69.5 ft					
Intermediate Cover	18	5	Fine Sandy Loam	$1.0x10^{-3}$	
Waste Layer	66	19	Municipal Waste w/ Channeling	$1.0x10^{-3}$	
Waste Layer	120	19	Municipal Waste w/ Channeling	$1.0x10^{-3}$	
Waste Layer	240	19	Municipal Waste w/ Channeling	$1.0x10^{-3}$	
Waste Layer	240	19	Municipal Waste w/ Channeling	$1.0x10^{-3}$	
Waste Layer	120	19	Municipal Waste w/ Channeling	$1.0x10^{-3}$	
Waste Layer	48	19	Municipal Waste w/ Channeling	$1.0x10^{-3}$	
Protective Sand Layer	24	5	Fine Sandy Loam	$1.0x10^{-3}$	
Bi-planar Geocomposite	0.27			6.8	Reduced transmissivity/hydraulic conductivity
60-mil Textured Liner	0.06	35	HDPE Membrane	$2.0x10^{-13}$	1 pinhole/acre (per EPA HELP Model Guide)
Tri-planar Geocomposite	0.25			13.4	Reduced transmissivity/hydraulic conductivity
60-mil Textured Liner	0.06	35	HDPE Membrane	$2.0x10^{-13}$	1 pinhole/acre (per EPA HELP Model Guide)
Clay Barrier	6	22	Loam	$1.9x10^{-5}$	

The user's guide for the HELP model suggests that using 0.5 to 1.0 pinholes per acre should account for manufacturer's and construction defects for the HDPE geomembrane liner. To be conservative, SCS used 1 pinhole per acre within the HELP model.

The HELP model also ranks geomembrane installation on a scale of 1 to 5, with 1 being perfect installation and 5 being the worst-case scenario for installation. The worst-case scenario assumes that the contact between the geomembrane and adjacent soil does not limit the drainage rate, resulting in a leakage rate controlled only by the pinhole. SCS used a installation ranking of 3, which represents good field installation with well-prepared, smooth soil surface and good geomembrane wrinkle control to insure good contact between geomembrane and adjacent soil that limits drainage rate.

Design Case Results

As stated above, various scenarios have been run to anticipate the amount of leachate generated throughout the life of the landfill cell. When reviewing HELP model results, it is imperative that the maximum head over the liner remain within the thickness of the geonet. The HELP model calculates flow through the geonet with McEnroe's equation; this equation is based on unconfined flow principles. McEnroe's equation assumes that the geonet drainage layer is infinite in thickness. When the head exceeds the geonet thickness, the HELP model assumes that the leachate can continue to stage up past the geonet layer thickness, yet still have the associated hydraulic conductivity of the geonet. In actuality, the leachate head is confined within the geonet layer and the leachate slug is moving at the hydraulic conductivity of the geonet and drainage sand. When the head over the liner exceeds the geonet thickness, the model becomes invalid. The geonet thickness for the respective scenarios is as follows:

- Case 1: Initial Waste Lift
  - Primary Collection System geonet thickness = 0.30 inches
  - Secondary Collection System geonet thickness = 0.30 inches
- Case 2: 10 feet Waste Lift
  - Primary Collection System geonet thickness = 0.29 inches
  - Secondary Collection System geonet thickness = 0.25 inches
- Case 3: 40 feet Waste Lift
  - Primary Collection System geonet thickness = 0.27 inches
  - Secondary Collection System geonet thickness = 0.25 inches
- Case 4: 69.5 feet Waste Lift
  - Primary Collection System geonet thickness = 0.27 inches
  - Secondary Collection System geonet thickness = 0.25 inches

Case 1 represents the initial placement of waste within the landfill cell; this scenario has the largest leachate generation quantity, as shown in Table H-1. The slope length of 45.6 feet and a slope of 2.19% generates the greatest quantity of leachate while keeping the maximum head on the liner within the thickness of the geocomposite thickness.

TABLE H-1. CASE 1, WASTE DEPTH = 0 FEET (PEAK VALUES)

	Collection System			Detection System		
	Maximum Head on Liner (inch)	**Leachate Collected (ft^3/day)***	**Leachate Collected (gal/min)***	**Maximum Head on Liner (inch)**	**Leachate Collected (ft^3/day)***	**Leachate Collected (gal/min)***
Length = 45.6 ft Slope = 2.19%	0.110	10,012	52.01	0.000	29	0.15
Length = 67 ft Slope = 3.13%	0.115	9,997	51.93	0.000	29	0.15
Length = 63.7 ft Slope = 2.81%	0.119	9,784	50.82	0.000	30	0.16

*Leachate Collected is on a per acre basis; the landfill expansion is approximately 10 acres.

Case 2 has the slope lengths and slopes after the landfill has settled due to the waste loadings. As shown in Table H-2, the slope length of 77.3 feet and a slope of 2.14% has the largest maximum head on the liner. The leachate production has decreased dramatically due to the waste within the cell.

TABLE H-2. CASE 2, WASTE DEPTH = 10 FEET (PEAK VALUES)

	Collection System			Detection System		
	Maximum Head on Liner (inch)	**Leachate Collected (ft^3/day)***	**Leachate Collected (gal/min)***	**Maximum Head on Liner (inch)**	**Leachate Collected (ft^3/day)***	**Leachate Collected (gal/min)***
Length = 47.2 ft Slope = 2.02%	0.192	6,080	31.58	0.001	42	0.22
Length = 77.3 ft Slope = 2.14%	0.282	5,741	29.82	0.001	51	0.27

*Leachate Collected is on a per acre basis; the landfill expansion is approximately 10 acres.

As shown in Cases 1 and 2, the addition of waste decreases the amount of leachate produced. This trend will continue as waste is added to the cell. Case 3, with 40 feet of waste, will generate approximately 2,996 cubic feet of leachate per day per acre of landfill. Case 4, with 69.5 feet of waste, will generate approximately 1,984 cubic feet of leachate per day per acre of landfill. See Tables H-3 and H-4 for Case 3 and Case 4, respectively.

TABLE H-3. CASE 3, WASTE DEPTH = 40 FEET (PEAK VALUES)

	Collection System			Detection System		
	Maximum Head on Liner (inch)	**Leachate Collected (ft^3/day)***	**Leachate Collected (gal/min)***	**Maximum Head on Liner (inch)**	**Leachate Collected (ft^3/day)***	**Leachate Collected (gal/min)***
Length = 77.3 ft Slope = 2.14%	0.150	2,996	15.56	0.003	73	0.38

***Leachate Collected is on a per acre basis; the landfill expansion is approximately 10 acres.**

TABLE H-4. CASE 4, WASTE DEPTH – 71.5 FEET (PEAK VALUES)

	Collection System			Detection System		
	Maximum Head on Liner (inch)	**Leachate Collected (ft^3/day)***	**Leachate Collected (gal/min)***	**Maximum Head on Liner (inch)**	**Leachate Collected (ft^3/day)***	**Leachate Collected (gal/min)***
Length = 77.3 ft Slope = 2.14%	0.100	1,984	10.31	0.001	30	0.15

*Leachate Collected is on a per acre basis; the landfill expansion is approximately 10 acres.

<u>Design of Leachate Collection Layer</u>

The leachate collection and removal system is designed to limit the hydraulic head on the liner to the thickness of the geocomposite layer. The primary leachate collection system is composed of double-sided, bi-planar geocomposite laid over the primary HDPE liner along the bottom and sides of the cell. The geocomposite is designed to maintain a high flow rate under the load exerted by the full height of the landfill waste.

Using Case 1, as described above, the estimated peak flow through the primary collection system is approximately 52 gallons per minute per acre that is open. SCS' calculations indicate that the transmissivity of the geocomposite is sufficient to maintain a head of approximately 0.11 inches or less (which is less than the thickness of the geocomposite) over the primary liner at this flow rate.

<u>Design of Leachate Disposal Pumps</u>

Peak daily leachate flows modeled by the HELP will also be used to assess the appropriate size of the leachate disposal pumps. SCS also considered a special design case (Case 1) for the pumps recognizing that solid waste operations can be substantially affected by the 24-hour, 25-year storm (i.e. total of 8.2 inches), especially early in the filling operation. This special case will consider major short-circuiting of rainfall in to the collection system caused by virtually no attenuation offered by the in-place waste. Essentially this is a flooded condition in the cell; the leachate level in the cell would be pumped down by the leachate pumps to normal conditions within approximately 48 hours.

The leachate disposal pumps are pumps rated at 200 gpm for the primary and secondary leachate collection system.

In summary, the range of peak design flows for sizing the leachate pumps are as follows:

- Case 1: 104 gpm. (assuming only 2 acres open for disposal initially)
- Case 2: 156 gpm. (assuming the entire Phase II Section II area is being used for disposal of waste)

The leachate pumping station will consist of one single leachate pump for handling flow from the primary leachate collection system and secondary detection system, respectively. The pumps will be rated for approximately 200 gpm, each. The pumps will be located within a sideslope riser pipe at the low point in the cell to allow easy access to the leachate collection pump.

Size of Leachate Sump

The leachate sump is sized to provide an adequate temporary storage volume for leachate until pumped from the cell. The volume of the sump was sized such volume provided will allow the pump cycle times to be less than the cycle time recommended by the manufacturer (thus extended the life of the pumps by not excessively starting and stopping). The proposed sump provides a net storage volume of approximately 800 gpm. Based upon the sump dimensions, incoming leachate flowrate, and pumping rate, the cycle time for the pumps will be approximately 10 minutes. This cycle time is less than the manufacturer's recommended maximum number of pump cycles. The sump size calculations are contained in Attachment H-13.

As cell waste volume increases and leachate flows begin to drop, the County may decide to change to smaller pumps that are better matched to the lower flows so that adequate running time for the pumps is provided.

Leachate Balance

Leachate is pumped from the landfill cell to the leachate lift station. Leachate is then pumped from the lift station with two existing 150-gpm pumps into the leachate storage tanks. These two leachate storage tanks can hold 79,000 gallons each. The County has secured interlocal agreements with the three surrounding wastewater treatment plants (WWTPs) for leachate disposal. The WWTPs and their respective leachate disposal quantities are as follows:

- City of Wauchula WWTP - 25,000 gal/day
- Wauchula Hills WWTP - 63,000 gal/day
- Vandolah WWTP - 25,000 gal/day

The following leachate disposal quantities are based on an open cell scenario. This scenario accounts for major short-circuiting of rainfall in to the collection system caused by virtually no attenuation offered by the in-place waste.

Average Rainfall Conditions --

Under average rainfall conditions the County can anticipate an additional 1.1 gpm of leachate for each acre that is open during an average rain event. The average rainfall condition represents the typical storm events the landfill receives. This additional leachate flow will require the County to increase their daily hauling amount from 4 loads per day to 5 loads per day to the City of Wauchula WWTP. See Attachment H-10 for the leachate balance calculations.

Peak Rainfall Conditions --

The peak leachate generation conditions occur with the 25-year/24 hour storm event (i.e. total of 8.2 inches)with an open cell. Based on the maximum amount of leachate that can be disposed at all three WWTP's, the landfill cell could be completely emptied within 48 hours of this storm event, with the County hauling 23 truckloads of leachate during this period. See Attachment H-10 for the leachate balance calculations.

H.2.c.3 Sub-base Design--

Rule 62-701.400(3)(c) requires that the sub-base below the lower geomembrane be a minimum of 6-inches thick and have a hydraulic conductivity equal to or less than $1x10^{-5}$ cm/sec. The sub-base will be constructed of a mixture of imported clay soil mixed on-site with native sand and clayey sand soils. A geotechnical consultant will be retained during construction to review the contractor's proposed soil mix proportions and procedures for placement, moisture control and final compaction. It is anticipated that the sub-base soil mixture will be placed in a loose, approximate 8 to 12-inch thick lift on the existing soil and compacted to a final thickness of 6 inches.

H.2.c.4 Leak Detection System Design Criteria--

The leak detection and secondary leachate collection system is designed to have a minimum hydraulic conductivity of 10 cm/sec and to limit the hydraulic head on the lower liner to less than the thickness of the leak detection system drainage layer.

The secondary leachate collection system is composed of double-sided, tri-planar geocomposite laid over the secondary HDPE liner along the bottom and sides of the cell. The geocomposite is designed to maintain a high flow rate under the load exerted by the full height of the landfill waste.

The HELP model was also used to estimate flow into the leak detection system. Using Case 1, as described above, the estimated peak flow through the primary liner into the secondary collection system is approximately 0.18 gallons per minute. SCS' calculations indicate that the transmissivity of the geocomposite is sufficient to maintain a head of approximately 0.003 inches or less (which is less than the thickness of the geocomposite) over the secondary liner at this flow rate.

H.2.d Standards for Geosynthetic Components

See Attachment H-1 for geomembrane specifications and Attachment H-2 for the liner Construction Quality Assurance (CQA) plan.

H.2.d.1 Geomembrane Seams--

Geomembrane seam strength will be tested as required by Rule 62-701.400(3)(d)(1), FAC. All field seams will be visually inspected and tested for seam continuity using suitable non-destructive techniques as described in the specifications (Attachment H-1) and the CQA Plan (Attachment H-2).

H.2.d.2 Spark Test--

The manufacturer of the HDPE membranes will be required to test the geomembrane using a continuous spark test. Only HDPE membranes found to have no defects will be used at the landfill.

H.2.d.3 Protective Layers over Upper Liner--

A 24-inch thick protective sand layer will be placed on top of the double-sided primary geocomposite material. The sand layer will be installed across the base of the cell and along the side slopes prior to the placement of the first lift of waste~~,~~. ~~but will not be placed on the side slopes until placement of waste has reached the toe of slope.~~

~~Sand will be pushed up the slope a limited distance corresponding to only that needed for placement of wastes and to form a solid support buttress against which the sand layer and waste can be safely built upon and extended up the slope.~~

H.2.d.4 First Layer of Waste---

Landfill personnel will take care when placing the first layer of waste over the 24-inch protective sand layer. This first layer of waste will consist of selected wastes containing no large, rigid objects that might damage the liner or leachate collection system and will be a minimum of four feet in compacted thickness. In order to minimize disturbance of the protective layer, traffic will be prohibited from traveling directly on top of the sand drainage layer. The first lift of waste will be deposited from the top of an adjacent working face, if possible, or otherwise from the end of a temporary dirt haul road.

H.2.d.5 GRI GM13 Specifications--

HDPE Geomembranes will be required to meet the specifications of GRI GM13.

H.2.d.6 PVC Geomembranes--

This requirement is not applicable to this project.

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H.2.d.7 Interface Shear Strength Testing--

Laboratory interface shear strength testing will be conducted on the actual lining system components proposed for use in the expansion. The results of this testing will be submitted to the FDEP prior to or during construction.

H.2.d.8 Transmissivity Testing--

Laboratory transmissivity testing will be performed on the bi-planar and tri-planar geocomposites; the results of this testing will be submitted to the FDEP prior to or during construction.

H.2.d.9 Hydraulic Conductivity Testing--

~~This requirement is not applicable to this project.~~ Permeability testing will be required on the 6-inch subbase materials. Refer to Technical Specification, Section 02212, in Attachment H-1.

H.2.e Geosynthetic Specifications

Technical specifications for geosynthetics are provided in Attachment H-1. These include definitions and requirements for the manufacture, handling, installation, and quality assurance for geomembrane, geocomposite, and geotextiles, as necessary. Geogrids and geosynthetic clay liners (GCL's) are not employed in this landfill expansion design.

H.2.f Soil Component Standards

The liner system sub-base is composed of soil. Rule 62-701.400(3)(c) requires that the sub-base below the lower geomembrane be a minimum of 6-inches thick and have a hydraulic conductivity equal to or less than 1×10^{-5} cm/sec. The sub-base will be constructed of a mixture of imported clay soil mixed on-site with native sand and clayey sand soils. A geotechnical consultant will be retained during construction to review the contractor's proposed soil mix proportions and procedures for placement, moisture control and final compaction. It is anticipated that the sub-base soil mixture will be placed in a loose, approximate 8 to 12-inch thick lift on the existing soil and compacted to a final thickness of 6 inches. The sub-base is the only soil component within the liner system.

H.3 LEACHATE COLLECTION AND REMOVAL SYSTEM (LCRS)

H.3.a Primary and Secondary LCRS Requirements

H.3.a.1 Chemical Compatibility--

The LCRS components, including geocomposites, geotextile, leachate collection pipe, leachate pump riser tubes, force main, and geomembranes, will be constructed of materials which are known to be chemically resistant to the leachate anticipated to be generated from the municipal solid waste placed in the cell. Aggregates for use in the LCRS will be non-calcareous (quartz) rock, which is inert to the leachate and does not form calcium carbonate deposits. The LCRS components are composed of the following

- Geotextile: Polypropylene or polyester.
- Geomembrane: High-Density Polyethylene (HDPE).
- Geocomposite (Geonet): Polyethylene core, polypropylene or polyester geotextile facing.
- Collection Header Pipe: High-Density Polyethylene (HDPE).
- Pump Intake & Riser Access Pipes: High-Density Polyethylene (HDPE).
- Force Main: High-Density Polyethylene (HDPE).

H.3.a.2 Mechanical Properties--

The pipes proposed for use in the leachate collection system and the leak detection system is smooth wall, HDPE pipes, with a minimum SDR of 11. The pipes with the respective SDR rating have been calculated to be of sufficient strength to withstand the pressures exerted during construction, operations and under the maximum permitted depth of municipal solid waste (See Attachment H-7 for pipe crushing calculations). The leachate header pipe will be a perforated 8-inch diameter pipe. The 24-inch diameter riser pipe for the leachate sump has a SDR rating of 17. Perforation diameter, spacing, and location are shown on the Construction Drawings.

H.3.a.3 Clog Prevention--

The proposed LCRS has been designed to maintain proper leachate flow and to maximize resistance to clogging. The main leachate collection header pipe will be encased in a graded aggregate backfill trench, wrapped with a woven geotextile, and covered with a 24-inch thick protective sand layer. The geotextile and graded aggregate have been designed to effectively filter out solids in the leachate and also to minimize sites or conditions at the rock and protective sand interface where growth of organisms can accumulate and prevent normal flow of leachate into the collection system (see Attachment H-8 for calculations).

Clogging is reduced within the geonet by bonding a non-woven geotextile to the geonet core. To account for possible reductions in flowrates, clogging, biological and chemical clogging factors were considered in transmissivity calculations when determining how much leachate flow will be anticipated. A 24-inch lift of sand will also be placed atop the geocomposite layer to further reduce the affects of clogging of the primary and secondary leachate collection systems.

The leachate pump intake tubes will be encased in large diameter, graded aggregate that will resist clogging and promote adequate flow to the pumps.

H.3.a.4 Cleaning and Inspection---

System Cleaning & Inspection

The design of the LCRS has taken into consideration the need to periodically test and clean the system and also to provide contingent design for unexpected problems that affect normal leachate flow. The pipe were sized, 8 inch diameter minimum, to allow for jet cleaning and tracked video camera equipment to travel approximately 1,000 feet in the pipes in one direction. Each end of the LCRS lateral pipeline has cleanout to allow access from either direction.

The main leachate collection header pipe will lie along the eastern and southern toe of slope in a manner so that access can easily be provided to insert a TV camera and flushing equipment. The leachate collection pipes have also been sized to accommodate a TV camera and flushing equipment.

The leachate pump is easily accessible from the surface and is equipped so that the pump and discharge piping can be completely removed for repairs or replacement. In addition, with the pumps removed, the portion of the pipe forming the intake section in the sump can have TV camera and flushing equipment inserted.

The leachate detection system will convey liquid in the tri-planar geocomposite to an 8-inch diameter header pipe located along the toe of slope on the eastside of the Phase II Section I disposal area. The south end of the leachate detection system header pipe has a cleanout to provide access with jet cleaning and video taping camera equipment.

Contingent Design

The geocomposite is proposed to cover the entire bottom and side slope of the cell and thus if a section becomes clogged, leachate can flow around this area and eventually will either discharge into the leachate collection header pipe or the leachate sump.

Should the main leachate collection header pipe become blocked, leachate can still flow directly to the sump through the geocomposite, or to the sump through the graded aggregate trench that encompasses the header pipe. See Attachment H-11 for the trench conveyance calculations.

H.3.b Primary LCRS Requirements

The primary leachate collection layer will consist of a 60-mil HDPE liner, overlain by a double-sided geocomposite overlain by a coarse sand approximately 24 inches thick.

H.3.b.1 Granular Drainage Media (24 inch thickness)

The sand drainage layer above the primary liner and geocomposite will have a minimum hydraulic conductivity of approximately 1×10^{-3} cm/sec. The drainage sand layer is approximately 24 inches thick.

H.3.b.2 Chemical Resistance of Granular Drainage Media

The silica sand is known to have good chemical resistance to the waste and quality of the leachate expected. It shall be composed only of naturally occurring hard, durable, uncoated grains of quartz. As stated in Section H.3.a.1, the geocomposite is constructed of polyethylene and polyester or polypropylene materials that also are known to have good chemical resistance to the waste and leachate expected.

H.3.b.3 LCRS Bottom Slope

The bottom slope of the LCRS has been designed to achieve the required leachate head after the predicted settlement determined by the foundation analysis. The settlement calculations are located in Section J.

H.3.b.4 Geosynthetic Equivalency to Granular Media

The LCRS design incorporates the required 24 inches of drainage sand along with a geocomposite. Laboratory tests will be conducted during the construction phase to demonstrate that the geocomposite will maintain the required hydraulic conductivity under full design load and maintain the liquid levels within the thickness of the geocomposite layer. The geocomposite includes two non-woven geotextile fabrics layers that will provide equal or better protection to the HDPE liner than a granular material.

H.4 LEACHATE RECIRCULATION

Leachate will be stored on-site in the leachate tanks until being hauled to local wastewater treatment facilities that have disposal agreements with the County. The County is not exploring the option of leachate recirculation at this time.

H.5 LEACHATE STORAGE TANKS AND SURFACE IMPOUNDMENTS

Hardee County Landfill currently stores leachate in two steel tanks with a capacity of 79,000 gallons each. The expansion will produce additional amounts of leachate resulting in more frequent hauling events to the wastewater treatment facility.

H.5.a <u>Surface Impoundment Requirements</u>

This section is not applicable. A leachate surface impoundment will not be used.

H.5.b <u>Above-ground Leachate Storage Tanks</u>

The previously permitted aboveground leachate storage tank will be used for storing leachate. There are no changes to the aboveground leachate storage tanks.

H.5.c Underground Leachate Storage Tanks

This section is not applicable to this permit application; an underground leachate storage tank will not be used.

H.5.d Routine Maintenance Schedule

Maintenance of the leachate collection system can be accomplished by accessing the leachate collection and detection pipes from the cleanouts located around the perimeter of the Phase II Section I and II areas. The modified Operations Plan for the Hardee County Landfill Expansion will be submitted with the revised fill sequence plans for the Phase I and Phase II areas.

H.6 GEOMEMBRANE CONSTRUCTION QUALITY ASSURANCE PLAN

The installation of the geosynthetic components (i.e., geomembrane, geonet, and geotextile) of the bottom liner system will be monitored in accordance with the CQA Plan, located in Attachment H-2. The CQA Plan describes procedures to be followed to certify the integrity of the geosynthetics. Technical specifications for the components of the bottom liner system are described in Attachment H-1. The CQA Plan includes a description of quality control testing procedures and frequencies, identification of key personnel (i.e., supervising professional, laboratory), and the forms used in the field for documenting the construction activities.

H.7 SOIL CONSTRUCTION QUALITY ASSURANCE PLAN

The installation of the soil component of the bottom liner system will be monitored in accordance with the CQA Plan. The CQA Plan, contained in Attachment H-2, describes procedures to be followed to certify that the soil was placed in accordance to the specification presented in this permit application. The CQA Plan and the specifications include descriptions for pre-qualifying borrow sources, field testing of the soils, quality control testing procedures and frequencies, qualification for key personnel, and quality control field documentation procedures and forms.

H.8 SURFACE WATER MANAGEMENT SYSTEM

H.8.a Department Permit for Stormwater Control

The County currently has three stormwater permits for the site.

- Management and Storage of Surface Water (MSSW) Permit (Number 477767.02) from the Southwest Florida Water Management District (SWFWMD) for the Animal Control Facility located on-site.

- MSSW Permit (Number 407767.01) from the SWFWMD for the Solid Waste Recycling Center located on-site.

- Environmental Resource Permit (Number 25-0124892-001) from the Florida Department of Environmental Protection (FDEP) for the Leachate Storage Tank Facility located on-site.

These three stormwater permits are located in Attachment H-12. The County is currently applying for an Environmental Resource Permit for the site.

H.8.b Surface Water Management System Design

The proposed stormwater management system will incorporate the existing detention pond as well as a proposed stormwater detention pond located on the southern end of the site. Stormwater runoff from the upper portion of the landfill travels via sheet flow into collection terraces located along the sideslopes of the landfill. Stormwater runoff flows within the collection terraces and is conveyed, via stormwater structures, down the landfill and into ditches that are located on the perimeter of the landfill.

The perimeter ditches convey stormwater runoff to a stormwater detention pond located in the northeast corner of the facility. As the stormwater runoff in the pond rises, an overflow structure located on the southern end of the pond, allows water to be discharged into the heavily vegetative area located on the eastside of the facility. Two culverts, located beneath the main access road, allow stormwater to flow from the eastside of the site under the road and along a channel to the proposed stormwater management area on the southern end of the site. This stormwater area is a wet detention pond that treats the first one-inch of stormwater runoff from the entire site. An overflow structure discharges the stormwater offsite. Once offsite the runoff flows overland and via naturally occurring channels until the flows eventually discharge into the Peach River. See Attachment H-9 for the stormwater management system calculations.

Approximately 11 acres of the landfill's stormwater will be routed to the existing stormwater detention pond. The swales discharge into pipes and/or other swales, or directly into the stormwater detention pond. The remaining acreage for the expansion will be routed to the proposed stormwater detention area located on the southern end of the site. The two on-site treatment ponds are wet detention ponds.

H.8.c Stormwater Control Details

Details of the storm water controls design, including collection channels, pipes, downchutes, energy dissipaters, outlet structures, and wet detention pond plantings is provided on the permit Plans attached to this permit application.

H.9 LANDFILL GAS CONTROL SYSTEMS

See Section O of this document for the landfill gas control system for the Hardee County landfill.

H.10 GEOMEMBRANE IN CONTACT WITH GROUNDWATER

See Section J of this document for the discussion regarding the bottom liner system in relation to the groundwater table. The Phase II expansion area design includes a groundwater collection system that will intercept the groundwater levels that exceed the seasonal high groundwater elevations recorded for the expansion area. Therefore, the geomembrane will not be in contact with the groundwater.

ATTACHMENT H-1

TECHNICAL SPECIFICATIONS

Specs

ATTACHMENT H-1
GEOTECHNICAL SPECIFICATIONS

DEP
JAN 25 2006
SOUTHWEST DISTRICT

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Section

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION

NOV 19 2004

SOUTHWEST DISTRICT
TAMPA

SECTION 01300
CONTRACTOR SUBMITTALS

PART 1 - GENERAL

1.01 GENERAL

A. Whenever submittals are required hereunder, all such CONTRACTOR submittals shall be submitted to the ENGINEER or as designated by the ENGINEER.

B. Within 10 days after Award, but prior to preconstruction meeting. The CONTRACTOR shall submit the following items to the ENGINEER for review:

1. A preliminary schedule of Shop Drawing submittals.

2. A list of all permits and licenses the CONTRACTOR shall obtain indicating the agency required to grant the permit and the expected date of submittal for the permit and required date for receipt of the permit.

1.02 SHOP DRAWINGS

A. Wherever called for in the Contract Documents, or where required by the ENGINEER, the CONTRACTOR shall furnish to the ENGINEER for review, five copies of each submittal. The term "submittal" as used herein shall be understood to include detail design calculations, shop drawings, fabrication and installation drawings, erection drawings, lists, graphs, operating instructions, catalog sheets, data sheets, samples, and similar items. Any submittal, which is not complete or does not provide the level of detail outlined in the specifications, shall not be considered acceptable for review and may be returned for resubmittal. Should any submittal be a part of any schedule milestone and is considered to be unacceptable by the COUNTY, the appropriate milestone shall be considered as not having been met until a complete and properly detailed submittal is received.

B. All shop drawings or other submittals shall be accompanied by the COUNTY'S standard submittal transmittal form. This form may be obtained in quantity from the ENGINEER at reproduction cost. Any submittal not accompanied by such a form or if all applicable items on the form are not completed, the submittal will be returned for resubmittal. Ultimate responsibility for the accuracy and completeness of the information contained in the submittal shall remain with the CONTRACTOR.

C. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the ENGINEER. Submittals shall be a complete package for each system.

D. Except as may otherwise be provided herein, the ENGINEER will return prints of each submittal to the CONTRACTOR, with its comments noted thereon, within a reasonable number of calendar days following their receipt by the ENGINEER. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submittal to the ENGINEER. The COUNTY reserves the right to withhold monies due the CONTRACTOR to cover additional costs of the ENGINEER'S review when multiple submittals are required due to CONTRACTOR'S failure to comply with the specifications.

E. If two copies of a submittal are returned to the CONTRACTOR marked **"NO EXCEPTIONS TAKEN,"** formal revision and resubmission of said submittal will not be required.

F. If two copies of a submittal are returned to the CONTRACTOR marked **"MAKE CORRECTIONS NOTED,"** formal revision and resubmission of said submittal will not be required.

G. If one copy of the submittal is returned to the CONTRACTOR marked **"AMEND - RESUBMIT,"** the CONTRACTOR shall have five work days to revise said submittal and shall resubmit five copies of said revised submittal to the ENGINEER.

H. If one copy of the submittal is returned to the CONTRACTOR marked **"REJECTED - RESUBMIT,"** the CONTRACTOR shall have five work days to revise said submittal and shall resubmit five copies of said revised submittal to the ENGINEER.

I. Fabrication of an item shall not commence before the ENGINEER has reviewed the pertinent submittals and returned copies to the CONTRACTOR marked either **"NO EXCEPTIONS TAKEN"** or **"MAKE CORRECTIONS NOTED."** Revisions indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis of claims for extra work.

J. All CONTRACTOR submittals shall be reviewed by an authorized representative of the CONTRACTOR prior to submission to the ENGINEER. Each submittal shall be dated, signed, and certified by the CONTRACTOR as being correct. No consideration for review by the ENGINEER of any CONTRACTOR submittals will be made for any items which have not been so certified by the CONTRACTOR. All non-certified submittals will be returned to the CONTRACTOR without action taken by the ENGINEER, and any delays caused thereby shall be the total responsibility of the CONTRACTOR.

K. The ENGINEER'S review of CONTRACTOR submittals shall not relieve the CONTRACTOR of the entire responsibility for the correctness of details and dimensions. The CONTRACTOR shall assume all responsibility and risk for any misfits due to any errors in CONTRACTOR submittals. Any fabrication or other work performed in advance of the receipt of approved submittals shall be entirely at the CONTRACTOR's risk and expense. The CONTRACTOR shall be responsible for the dimensions and the design of adequate connections and details.

1.03 CONTRACTOR'S SCHEDULE

A. The schedule shall be comprehensive, covering both activities at the site of the WORK and offsite activities such as design, procurement, and fabrication. The schedule shall be orderly and realistic and shall be revised as necessary to meet this requirement. The CONTRACTOR shall promptly advise the ENGINEER of any occurrence that may impact the schedule. No revision to the schedule can be made without the review and acceptance by the ENGINEER.

B. The CONTRACTOR shall assist the ENGINEER in reviewing and evaluating each schedule furnished. Schedules which are not accepted and which are returned to the CONTRACTOR shall be revised to correct the defects noted and shall be resubmitted to the ENGINEER within fifteen calendar days after receipt.

C. When required to perform and complete the changed WORK in accordance with the revised schedule, the CONTRACTOR shall provide additional labor, materials, equipment, or other factors of production in excess of those in use before the changed WORK was ordered.

1.04 SAMPLES

A. CONTRACTOR's samples shall be prepared, submitted, reviewed, monitored and approved in accordance with this paragraph and paragraph 7.12 of the General Conditions.

B. Unless otherwise specified, wherever in the Specifications samples are required, the CONTRACTOR shall submit not less than two samples of each item or material to the ENGINEER for approval at no additional cost to the COUNTY.

C. Samples, as required herein, shall be submitted for approval a minimum of fifteen working days prior to ordering such material for delivery to the jobsite and shall be submitted in an orderly sequence so that dependent materials or equipment can be assembled and reviewed without causing delays in the WORK.

D. All samples shall be individually and indelibly labeled or tagged, indicating thereon all specified physical characteristics and manufacturer's name for identification.

E. Unless otherwise specified, all colors and textures of specified items will be selected by the COUNTY from the manufacturer's standard colors and standard product lines.

1.05 TECHNICAL MANUALS

A. The CONTRACTOR shall furnish to the ENGINEER three identical sets of technical manuals. Each set shall consist of one or more volumes, each of which shall be bound in a standard size, three-ring, looseleaf, vinyl plastic hard cover binder suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches. A table of contents shall be provided which indicates all equipment in the technical manuals.

B. The technical manuals shall include for each item of mechanical and electrical equipment:

1. Complete operating instructions, including location of controls, special tools or other equipment required, related instrumentation, and other equipment needed for operation.

2. Lubrication schedules, including the lubricant SAE grade and type, temperature range of lubricants, and frequency of required lubrication.

3. Preventive maintenance procedures and schedules.

4. Parts lists by generic title and identification number complete with exploded views of each assembly.

5. Disassembly and reassembly instructions.

6. Name and location of nearest supplier and spare parts warehouse.

7. Recommended troubleshooting and start-up procedures.

8. Reproducible prints of the record drawings, including diagrams and schematics, as required under the electrical and instrumentation portions of these specifications (if any).

C. The CONTRACTOR shall submit the required technical manuals complete and in the number and fashion specified prior to requesting payment in excess of seventy-five percent of the base contract value. Failure to do so shall be cause for the COUNTY to withhold any further payments to the CONTRACTOR until the requirements of this paragraph have been met.

1.06 SPARE PARTS LISTS

A. The CONTRACTOR shall furnish to the ENGINEER three identical sets of spare parts information for all mechanical, electrical, and instrumentation equipment. The spare parts list shall include the current list price of each spare part. The spare parts list shall be limited to those spare parts, which the manufacturer recommends, be maintained by the COUNTY in inventory at the site. Each manufacturer of supplier shall indicate the name, address, and telephone number of its nearest outlet of spare parts to facilitate the COUNTY in ordering. The CONTRACTOR shall cross-reference all spare parts lists to the equipment numbers designated in the specifications or on the drawings.

The spare parts lists shall be bound in standard size, three-ring, looseleaf, vinyl plastic hard cover binders suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches.

B. The CONTRACTOR shall submit the required spare parts lists complete and in the number and fashion specified prior to requesting payment in excess of seventy-five percent of the base contract value. Failure to do so shall be cause for the COUNTY to withhold any further payments to the CONTRACTOR until the requirements of this paragraph are met.

1.07 RECORD DRAWINGS

A. Contractor's record drawings shall be maintained in accordance with this Section, Article 7.9 of the General Conditions, and the Supplemental Conditions.

B. The CONTRACTOR shall keep and maintain at the job site one record set of drawings. On these, the CONTRACTOR shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Drawings, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated or which were not indicated on the Contract Drawings. Said record drawings shall be supplemented by any detailed sketches or typewritten changes to the specifications, as necessary or directed to indicate fully the WORK as actually constructed. These master record drawings of the CONTRACTOR'S representation of as-built conditions, including all revisions made necessary by addenda, change orders, and the likes shall be maintained up-to-date during the progress of the WORK.

C. In the case of those drawings which depict the detail requirements for equipment to be assembled as wired in the factory, such as motor control centers and the like, the record drawings shall be updated by indicating those portions which are superseded by change order drawings or final shop drawings and by including appropriate reference information describing the change orders by number and the shop drawings by manufacturer, drawing, and revision number.

D. Record drawings shall be accessible to the ENGINEER at all times during the construction period and shall be delivered to the ENGINEER, upon completion of the WORK prior to final acceptance of project.

E. Application for Payment will not be approved if the record drawings are not kept up to date.

F. Final payment will not be approved until the CONTRACTOR prepared record drawings have been approved by the ENGINEER. Record drawings may be in the form of a set of prints with carefully plotted information overlaid in red pencil or in electronic format compatible with AutoCAD 2000.

G. Upon substantial completion of WORK and prior to final acceptance, the CONTRACTOR shall complete and deliver a complete set of record drawings to the ENGINEER for transmittal to the COUNTY, conforming to the construction records of the CONTRACTOR. This set of drawings shall consist of corrected plans showing the reported location of the WORK. The information submitted by the CONTRACTOR and incorporated by the ENGINEER into the record drawings will be assumed to be reliable, and the ENGINEER will not be responsible for the accuracy of such information, nor for any errors or omissions which may appear on the record drawings as a result.

1.08 EXCAVATION PLAN

A. CONTRACTOR shall prepare and submit to the ENGINEER for approval an excavation plan for the WORK contained in the Contract prior to beginning the WORK. The plan shall indicate the general plan for performing excavation. The excavation plan is to be provided for information only. Submission and acceptance by the ENGINEER of this information shall not relieve the CONTRACTOR from constructing the WORK in a continuously safe manner at all times and in accordance with the Contract Documents.

1.09 SITE CONDITIONS SURVEYS

A. CONTRACTOR shall submit the site conditions survey data as required in the Section 01050, "Site Conditions Surveys."

1.10 PROGRESS REPORTS

A. A progress report shall be furnished to ENGINEER with each Application for Payment. If the WORK falls behind schedule, CONTRACTOR shall submit additional progress reports at such intervals as ENGINEER may request.

B. Each progress report shall include sufficient narrative to describe any current and anticipated delaying factors, their effect on the construction schedule, and proposed corrective actions. Any WORK reported complete, but which is not readily apparent to ENGINEER, must be substantiated with satisfactory evidence.

C. Each progress report shall include a list of the activities completed with their actual start and completion dates, a list of the activities currently in progress, and the number of working days required to complete each.

1.11 SCHEDULE OF VALUES

A. Contractor's Schedule of Values shall be prepared, submitted, reviewed, monitored and approved in accordance with this Section and Article 15.1 of the General Conditions.

B. At least ten days prior to submitting the first Application for Payment the CONTRACTOR shall prepare and submit to ENGINEER a schedule of values covering each lump-sum item. The schedule of values showing the value of each kind of work shall be acceptable to ENGINEER before any partial payment estimate is prepared. Such items as Bond premium, temporary construction facilities, and plant may be listed separately in the schedule of values, provided the amounts can be substantiated.

C. The sum of the items listed in the schedule of values shall equal the contract lump sum price. Overhead and profit shall not be listed as separate items in the schedule of values.

D. An unbalanced schedule of values providing for overpayment of CONTRACTOR on items of WORK which would be performed first will not be accepted. The schedule of values shall be revised and resubmitted until acceptable to ENGINEER.

1.12 SURVEY DATA

A. All field books, notes, and other data developed by CONTRACTOR in performing the surveys required by the WORK shall be available to ENGINEER for examination throughout the construction period. All such data shall be submitted to ENGINEER with documentation required for final acceptance of the WORK.

1.13 QUALITY ASSURANCE/QUALITY CONTROL PLAN

A. CONTRACTOR's Quality Control responsibilities shall be discharged in accordance with this Section, Article 14.2.2 of the General Conditions.

B. CONTRACTOR shall prepare and submit a Quality Assurance/Quality Control Plan for the WORK contained in the Contract prior to beginning the WORK. This Plan will indicate the actions, documentation, and responsible party or parties that will assure compliance with the specifications and plans, and that quality requirements for inspections and testing are implemented. The Plan will contain a checklist of quality related activities applicable to various construction activities for scheduling and implementation purposes.

1.14 DAILY FORCE REPORT

CONTRACTOR shall submit to the ENGINEER, or designee, a daily force report. The report shall be delivered not later than 9 a.m. of the work day following the report date and shall include the following:

A. Day of week, date, CONTRACTOR name, CIP number, and Report number.

B. Summary of work in process (segregated by CONTRACTOR and Subcontractor).

C. Details of work accomplished including quantities of work installed.

D. Summary of equipment working and where working.

E. Summary of manpower by work element and Subcontractor.

F. Receipt of major equipment or materials.

1.15 QUALITY CONTROL TESTING LOG

A. The CONTRACTOR shall submit for approval a testing log which lists all of the required quality control tests and which has columns for when the test is performed and if the test result is satisfactory. The CONTRACTOR will submit monthly updated testing logs with the application for payment.

1.16 QUALITY CONTROL REPRESENTATIVE'S RESUME

A. The CONTRACTOR shall submit the Quality Control Representative's resume to the ENGINEER within fifteen days of the Notice to Proceed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION -

SECTION 02140
DEWATERING

D.E.P.
MAY 2 3 2005
Southwest District Tampa

PART 1 - GENERAL

1.01 SUMMARY

A. The work specified under this Section includes furnishing all equipment and labor necessary to remove storm and subsurface waters from the excavation and backfill areas during completion of the Work.

1.02 RELATED SECTIONS

A. Section 02220 – Excavating, Backfill, Compaction, Fill and Grading

1.03 SUBMITTALS

A. Prior to any construction, the CONTRACTOR shall submit a dewatering plan outlining methods, equipment, and layout for dewatering and disposal of pumped waters. The dewatering plan will include, at a minimum, the dewatering pump discharge locations, pump sizes, details on the discharge outlets, placement and location of the sediment and turbidity controls, and flocculants (if used).

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 DEWATERING

A. The CONTRACTOR shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory foundation condition until the fill, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels.

B. If stormwater or subsurface waters are encountered or inhibit construction operations or compaction, the CONTRACTOR shall utilize equipment properly sized and specifically designed, for removal of the water.

C. The dewatering method shall consist of lowering and maintaining the water levels and hydrostatic pressures of the groundwater a minimum of 2 feet below the lowest elevation of construction.

D. If construction activities bring water to the surface or the ground exhibits pumping during compaction, water levels shall be lowered to an elevation to achieve the specifications in the Contract Documents.

E. Construction operations, including backfilling and compaction, shall be performed in near-dry conditions. Moisture levels within the soils shall be maintained within the range necessary to achieve the specifications as outlined in the Contract Documents.

F. Dewatering methods shall not adversely affect constructed slopes nor on-site structures.

3.02 QUALITY CONTROL

A. The CONTRACTOR shall coordinate his work with the ~~PROJECT MANAGER~~ ENGINEER to allow testing and monitoring of all work components to proceed.

B. The CONTRACTOR's supervisor of the dewatering operations shall have a minimum of 3 years of experience in dewatering activities.

C. The CONTRACTOR's supervising personnel of the dewatering system shall maintain adequate supervision and control to ensure stability of the excavated slopes, the construction area is not adversely affected by water, erosion is controlled, flooding of the excavation and downstream area does not occur, and sedimentation and turbidity are maintained within local, state, and federal guidelines.

D. The CONTRACTOR's supervisor of the dewatering operations shall dispose of the waters in strict accordance with the most recent revisions of all local, state and federal rules and regulations. The CONTRACTOR will comply with the site specific's dewatering plan and permits.

E. The CONTRACTOR shall acquire all construction-related permits required to discharge the waters.

F. All dewatering pump(s) will discharge water into areas where precautions are taken by the CONTRACTOR, to minimize erosion, sedimentation, and turbidity due to dewatering activities. The precautions will include, at a minimum, a reinforced area lined with rirpap and geotextile at every discharge point. In addition, every 100 feet downstream of the discharge point, silt fencing and haybales will be placed to minimize sedimentation and turbidity. If the dewatering pump intake in on floating barrels then shut-off floats will be used to shut down dewatering pumps before sediments are taken in by the pump.

Floating turbidity barriers upstream and downsteam of the intake and discharge points are also required.

G. Sedimentation build-up will be removed from silt fence upon build-up of more than 12-inches of sediment. Haybales or turbidity logs that have become clogged with sediment will be removed and replaced. A haybale or turbidity barrier will be deemed clogged if the surface is visible coated with fine sediments, or water is observed as not flowing through the bales, or as directed by the ENGINEER OR COUNTY.

H. If turbidity flocculation blocks or additives are proposed for this project, the CONTRACTOR will submit the product information, to include application rates, additive formulation of the flucculating agent, and disposal requirements for the flocculated sediment, prior to use on this project.

~~F.~~I. There shall be no additional compensations to the CONTRACTOR for any construction delays caused by the CONTRACTOR's failure to plan, coordinate, and schedule work to include all CQA activities.

3.03 WATER LEVELS

A. Subsurface (groundwater) elevations and stormwater runoff vary with time of year and rainfall amounts across the limits of construction as defined in the Contract Documents. Neither the ENGINEER, nor the ~~OWNER~~ COUNTY, can accurately estimate the water elevations that may be encountered during construction.

B. Stormwater measures shall be controlled by the CONTRACTOR to minimize erosion and flooding within and outside of the construction area.

- END OF SECTION -

SECTION 02212 - LOW PERMEABILITY SOIL

Part 1 - GENERAL

1.01 SUMMARY

A. The WORK specified in this Section includes excavation, transporting, stockpiling, mixing, moisture conditioning, spreading, compacting, grading, rolling, testing, inspection and repairing of the low permeability soil layer system as shown on the Drawings and as specified herein.

1.02 QUALITY CONTROL/QUALITY ASSURANCE

A. Construction Quality Control (CQC) will be performed by an independent geotechnical consultant retained by the CONTRACTOR. All reports, inspections, testing and related activities of the CQC Consultant shall be at the CONTRACTORS expense. The CQC consultant shall not be the same consultant retained by the COUNTY for Construction Quality Assurance. The CQC consultant shall oversee all low permeability soil installation activities and the quality control testing as specified herein. The CQC consultant shall prepare a final report certifying the low permeability soil and installation are in accordance with the Contract Documents. The final report shall be signed and sealed by a professional engineer licensed in the State of Florida.

B. Construction Quality Assurance (CQA) will include field and laboratory testing during liner construction, which will be conducted by a qualified soil-testing laboratory representing the COUNTY. A qualified field technician representing the COUNTY shall provide full time, on-site inspection during liner construction. The field technician shall work under the supervision of a professional engineer with experience in soil liner construction.

C. The CONTRACTOR shall schedule his work so as to provide sufficient time as required to complete CQC and CQA field testing and shall keep the laboratory informed of the progress.

1.03 SUBMITTALS

A. CQC Qualifications: Qualifications of the CQC Consultant shall be submitted to the ENGINEER in accordance with Section 01300-Submittals prior to any geotechnical testing of the low permeability soil material, including tests conducted on the borrow source.

B. CQC Plan: The CONTRACTOR shall prepare and submit a Construction Quality Control Plan to the ENGINEER in accordance with Section 01300-Submittals prior to any geotechnical testing of the low permeability soil materials, including tests conducted on the borrow source.

The CQC Plan shall include project to outline project specifications and construction requirements. The plan shall specify performance criteria for the soil liner, and provide quality control testing procedures and minimum sampling frequencies. In addition, the plan shall define the responsibilities of the parties that will be involved in soil liner construction, and shall present minimum qualifications of each party to fulfill their identified responsibilities.

C. Borrow Source Qualifications

1. Notification: The CONTRACTOR shall notify the ENGINEER in writing of the individual on-site or off-site borrow source(s) for the low permeability soil at least 7 calendar days prior to the date of anticipated construction use of such material. Notification of individual borrow source(s) shall include:

   a. Supplier's name and borrow location.

   b. Verification that adequate quantities are available to complete the work.

   c. Three representative samples of the proposed low permeability soil at no additional cost to the COUNTY. The three samples shall consist of 1-gallon, individually sealed containers of the proposed low permeability soil.

2. Borrow Source Report: The CONTRACTOR shall prepare and submit a Borrow Source Report to the ENGINEER in accordance with Section 01300-Submittals prior to any geotechnical testing of the low permeability soil materials. The Borrow Source Report shall document the horizontal and vertical extent and the homogeneity of the soil strata proposed for use as liner material.

   a. The CONTRACTOR shall notify the ENGINEER in writing a minimum of 3 working days prior to sampling and shall coordinate the ENGINEER's observation of borrow source sampling. ENGINEER reserves the right to obtain independent samples. Rejection by the ENGINEER of the low permeability soil for not meeting the Specification requirements shall not relieve the CONTRACTOR of submitting the required data for an alternate borrow source. Additional costs or delays resulting from the rejection of a soil shall be at no cost to the COUNTY.

   b. The report shall be signed by a professional engineer registered in the State of Florida to certify the soil furnished for the low permeability soil complies with the Specification requirements and include all borrow source information and test result data.

c. The CONTRACTOR shall submit to the ENGINEER field and laboratory test data prior to importing and/or prior to any construction using the low permeability soil. Soils shall not be imported and/or used for construction on the project until approved by the ENGINEER.

d. Laboratory testing shall be performed on the proposed low permeability soil borrow source by the CQC consultant with the results submitted to the ENGINEER at least 7 calendar days prior to test strip installation. Representative samples shall be collected from a minimum of 3 locations in the proposed borrow source and submitted to the CQC consultant for testing. Testing shall be in accordance with Table 02212-2.

D. Test Section Report: The CONTRACTOR shall prepare and submit a Test Section Report to the ENGINEER in accordance with Section 01300-Submittals upon completion of the Test Section, and prior to full-scale installation of the low permeability soil material. The report shall be signed by a professional engineer registered in the State of Florida. The report shall include laboratory results, and proposed full-scale installation methods (e.g., equipment, number of passes, moisture conditioning, destructive test repair methods, etc.) based upon the results of the test section as described in Part 3.02, this Section.

E. Testing Results During Construction: During the installation of the low permeability soil, the CQC Consultant shall provide the ENGINEER with preliminary laboratory test results, in writing, for the purposes of CQA monitoring.

F. Final Report: The CONTRACTOR shall prepare and submit a Final Report to the ENGINEER in accordance with Section 01300-Submittals upon completion of the installation of the low permeability soil material.

The report shall include all laboratory test results and a map, drawn by the CQC Consultant, which indicates the location and type of the test. The CQC Consultant shall record all test locations on a test location map. The laboratory test results shall be identified, numerically, alphabetically or a combination, in the report. A location map shall correlate the laboratory test identification with test location by use of a key or legend. Laboratory tests are outlined in Table 02212-1. The location map shall be the same scale as the Drawings and accurately depict field test locations. The report shall be signed and sealed by a professional engineer registered in the State of Florida.

1.04 LABORATORY HYDRAULIC AND LEACHATE CONDUCTIVITY TESTING

A. Hydraulic Conductivity Test Using Water

1. Hydraulic Conductivity test samples, using water, shall be encapsulated within a flexible latex membrane and mounted in triaxial-type permeameters per ASTM

D-5084. The test specimens shall then be consolidated under an isotropic consolidation stress of no greater than 10 psi and permeated with water under an adequate back pressure to achieve saturation of the test specimens. The inflow and outflow from the samples shall then be monitored and the coefficient of permeability calculated for each recorded flow increment using the constant head method. The tests shall continue until steady-state flow is achieved as evidenced by values of inflow and outflow that do not differ by more than 20 percent, and by stable values of the coefficient permeability. Time and flow data shall be recorded for at least one day beyond the time when the inflow and outflow rates meet the above criterion, at which time the pressures may be relieved and physical measurements of the specimens obtained for calculations. Hydraulic gradients shall be in accordance with the values in ASTM D-5084 unless otherwise approved by the ENGINEER.

2. Deaired potable water shall be used in laboratory hydraulic conductivity tests.

B. Hydraulic Conductivity Test Using Leachate (EPA Test Method 9100)

1. Hydraulic Conductivity test samples, using water, shall be encapsulated within a flexible latex membrane and mounted in triaxial-type permeameters per ASTM D-5084. The test specimens shall then be consolidated under an isotropic consolidation stress of no greater than 10 psi and permeated with water under an adequate back pressure to achieve saturation of the test specimens. The inflow and outflow from the samples shall then be monitored and the coefficient of permeability calculated for each recorded flow increment using the constant head method. The tests shall continue until steady-state flow has been achieved as evidenced by values of inflow and outflow that do not differ by more than 20 percent, stable values of the coefficient permeability have been achieved, and a minimum of two pore volumes have passed through the sample <u>after</u> stabilization. Time and flow data shall be recorded for at least one day beyond the time when the inflow and outflow rates meet the above criterion, at which time the pressures may be relieved and physical measurements of the specimens obtained for calculations. Hydraulic gradients shall be in accordance with the values in ASTM D-5084 unless otherwise approved by the ENGINEER.

2. Deaired leachate shall be used in leachate hydraulic conductivity tests.

C. If tests conducted by the CQC Consultant indicate that the material does not meet specification requirements, the soil material shall be rejected. CONTRACTOR shall be responsible for all additional costs for testing and inspection as a result of failure of the material to meet specification requirements.

D. The water used for laboratory testing or for field moisture conditioning of the low permeability soil shall be clean and uncontaminated, and shall be obtained at no additional cost to the COUNTY. Laboratory water can be distilled or tap water. Saltwater shall not be used.

PART 2 - PRODUCTS

2.01 MATERIALS

A. The low permeability soil shall be a fat clay (CH), clayey sand (SC) or lean clay (CL) as classified by the Unified Soil Classification System.

B. The low permeability soil shall be free from organics, roots, rubbish or debris, rocks (greater than 1/4-inch in any dimension), sticks (greater than 1/4-inch in diameter), calcareous deposits, or any other deleterious material. The CONTRACTOR shall remove any materials which the ENGINEER considers to be objectionable in the low permeability soil at no additional cost to the COUNTY.

C. Testing for final acceptance shall be performed by the CQC consultant in accordance with these specifications.

D. Installed low permeability soil which does not meet the specifications shall be reworked, retested, and replaced if required at no additional cost to the COUNTY.

2.02 BORROW SOURCE

A. Prior Test Results: A borrow source for the low permeability soil can be approved by the ENGINEER if demonstrated field experience is available in the form of geotechnical reports from at least three prior successful projects of five or more acres each to document that a given borrow source can meet the requirements of the project specifications, then extensive laboratory testing of the borrow source will not be required. However, additional testing is required for this project to verify that the material is geologically similar to those used on the prior projects. At a minimum, 3 representative samples from the appropriate thickness of the in-situ stratum or from stockpiles of the borrow material proposed for liner construction shall be submitted to an independent soil testing laboratory to document through index testing that the proposed material is consistent with the material used on prior successful projects. Testing shall be in accordance with Table 02212-1.

B. Source Material Testing: If demonstrated field experience is not available or cannot be documented, then the following requirements shall be met:

1. In support of the Borrow Source Report specified in Part 1.03 (C), the CONTRACTOR shall perform the index tests as stipulated in Table 02212-2 for each potential borrow stratum to quantify the variability of the borrow materials and to document that the proposed borrow material complies with these specifications on a minimum of 3 samples. The borrow source will only be

considered suitable if the hydraulic conductivity of the material, as documented on laboratory test specimens, can be shown to meet the requirements of the project specifications at the 98 percent confidence level.

2. At a minimum, the following data shall be submitted to the ENGINEER with the results of each permeability test:

    a. Dates samples collected.
    b. Sample number and location.
    c. Sampling method.
    d. Specimen length and diameter.
    e. Specimen dry unit weight and in situ moisture content.
    f. Hydraulic gradient.
    g. Degree of saturation.
    h. Maximum cell pressure and back pressure.
    i. Calculated permeability.
    j. Name and signature (with date) of person performing quality assurance check for the CQC consultant.

TABLE 02212-1. BORROW SOURCE VERIFICATION TESTING REQUIREMENTS

Description	Specified Value	Method
Percent passing No. 200 sieve	none	ASTM D-1140 or D-421/D-422
Atterberg Limits:		
-Liquid Limit (percent)	20<LL<80	ASTM D-4318
-Plasticity Index (percent)	10<PI<40	
Moisture Content	none	ASTM D-2216
Density	[1]	ASTM D-698

Notes for Table 02212-1:

[1] Required range of moisture content to be determined as a result of the laboratory and test section. The anticipated moisture range is between -1 percent to +3 percent of the optimum moisture content. The minimum percent compaction shall be 92 percent of the Standard Proctor.

TABLE 02212-2. NEW BORROW SOURCE TESTING REQUIREMENTS

Description	Specified Value	Method
Percent passing No. 200 sieve	Less than 25%	ASTM D-1140 or D-421/D-422
Atterberg Limits: -Liquid Limit (percent) -Plasticity Index (percent)	 $20<LL<80$ $10<PI<40$	 ASTM D-4318
Moisture Content	none	ASTM D-2216
Density	[1]	ASTM D-698
Maximum Permeability	$1.0 \times 10^{-\underline{5}\cancel{7}}$ cm/sec	ASTM D-5084
Permeability using Leachate[2]	$1.0 \times 10^{-\underline{5}\cancel{7}}$ cm/sec	EPA Method 9100

<u>Notes for Table 02212-2:</u>

[1] Required range of moisture content to be determined as a result of the laboratory and test section. The anticipated moisture range is between -1 percent to +3 percent of the optimum moisture content. The minimum percent compaction shall be 92 percent of the Standard Proctor.

[2] Conduct test in accordance with USEPA Test Method 9100 on one representative sample using leachate from the Hardee County Landfill.

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PART 3 - EXECUTION

3.01 SUBGRADE PREPARATION

A. Prior to the installation of the low permeability soil, ~~clear, excavate, backfill,~~ compact, and grade as shown on the Drawings and as specified herein. Subgrade preparation activities shall be performed in accordance with Section 02220.

B. Rocks (greater than ~~3~~2-inch in any dimension), sticks (greater than 1/4-inch in diameter), roots, debris or any other deleterious materials shall not be permitted within 6 inches of the surface upon which the low permeability soil will be installed.

C. Surface of prepared subgrade shall be free of irregularities, loose soil, and abrupt changes in grade.

D. Subgrade Testing: Density tests shall be conducted on the completed surface of the subgrade using the Standard Proctor Method (ASTM D-698) at a frequency of 2 tests per acre.

E. The surface of the prepared subgrade shall be inspected by the ENGINEER prior to installation of the low permeability soil. If subgrade conditions do not meet the requirements as specified, including grades, density, moisture, or deleterious materials, corrective action by the CONTRACTOR shall be completed prior to proceeding with the installation of the low permeability soil at no additional cost to the COUNTY.

3.02 TEST STRIP SECTION

A. Prior to full-scale liner installation, a field test section or test strip shall be constructed at the site above the prepared subgrade to verify that the proposed low permeability soil and construction techniques will consistently achieve the parameters specified herein.

B. The dimensions of the test section shall be a sufficient size as determined by the CONTRACTOR (a minimum of not less than 50 feet wide by 200 feet long) such that full-scale liner installation procedures can be duplicated within the test section. The test section shall be located within the construction area over which the low permeability soil will be installed.

C. The test section shall be constructed using the same equipment for spreading, kneading and compaction and the same construction procedures (e.g., number of passes, moisture addition and homogenization, if needed) that are anticipated for use during full-scale liner installation.

D. The low permeability soil shall be placed in a maximum single 8-inch loose lift, and then compacted and tested as required herein. The total in-place compacted low permeability soil thickness shall be a minimum of 24 inches. A compacted in-place 6-inch thickness is defined as one lift.

E. The CQC consultant shall observe the construction of the test section and document the equipment and methods used during test section construction, including:

1. Placement and spreading.
2. Resulting loose lift thickness.
3. Uniformity of soil after spreading.
4. Incorporation of water (i.e. moisture conditioning).
5. Equipment type, weight, configuration, and number of passes.
6. Repair of disturbances due to quality assurance sampling.

F. The CQC consultant shall perform and report all necessary sampling and testing of the test section to determine the optimum percent compaction and corresponding molding moisture content (and range) in order to achieve a coefficient of permeability less than specified.

G. The test strip shall be considered acceptable if the measured hydraulic conductivities of undisturbed samples from the test strip meet the requirements of the project specifications at the 98 percent confidence level.

H. Compaction requirements for soil shall be established by the CQC consultant based upon the test section results and pre-construction laboratory test results.

I. If the test section fails to achieve the desired results, additional test sections shall be constructed and tested by the CONTRACTOR at no additional cost to the COUNTY.

J. Additional testing shall be conducted on test section if any construction techniques (e.g., addition of moisture, additional passes of equipment, different equipment) or soil materials are altered. Testing and inspecting the new test section will be at no additional cost to the COUNTY. New test sections shall be constructed and tested at no additional cost to the COUNTY.

K. At a minimum, the liner test section shall be subject to the field and laboratory testing requirements presented in Table 02212-3. The test locations shall be selected at random by the ENGINEER.

L. Laboratory hydraulic conductivity testing shall be conducted in triaxial type permeameters (ASTM D-5084). The test specimens shall be consolidated under an isotropic consolidation stress no greater than 10 pounds per square inch and permeated with water under an adequate backpressure to achieve saturation of the test specimens. The inflow to and outflow from the specimens shall be monitored with time and the hydraulic conductivity calculated for each recorded flow increment. The test shall continue until steady state flow is achieved and relatively constant values of hydraulic conductivity are measured (ASTM D-5084).

3.03 PLACING LOW PERMEABILITY SOIL

A. Full scale liner installation may begin only after completion of a successful liner test section.

B. The CONTRACTOR shall be responsible for maintaining the low permeability soil stockpile at the landfill site by sloping and compacting it so that it will not become soft and overly saturated during rain events, or desiccate from dryness.

C. Installation procedures developed during test section construction shall be utilized for the entire low permeability soil.

D. Testing methods and frequencies during the installation of the low-permeable soil beyond the test section area and for the remainder of the project shall be in accordance with Table 02212-4. ***However, during construction of the first 5 acres of the liner, these frequencies shall be doubled.*** Samples shall be obtained from random locations selected by an independent soil testing laboratory. If there are indications of a change in product quality or construction procedures during liner construction, the ENGINEER may select additional to determine compliance.

E. At the time of compaction, the molding moisture content in the soil shall be within the range determined by the test section results.

1. For soil that is above the optimum soil moisture content range as determined by the CQC consultant, the CONTRACTOR shall spread, dry, and rehomogenize the soil in order to meet the specifications.

2. For soil that is below the optimum soil moisture content range as determined by the CQC soils testing laboratory, the CONTRACTOR shall add water uniformly over the soil, then homogeneously mixing and kneading to achieve a uniform moisture content throughout the lift.

F. Adjacent soil strips shall be scarified at the end and overlapped to assure adequate bonding.

G. REWORKING OR REPAIRING AREAS: The results of all permeability tests performed on undisturbed samples of the low permeability soil shall be less than or equal to the value in Table 02212-4. In the event the permeability is greater than specified, the CONTRACTOR shall, at no additional expense to the COUNTY, rework the represented area. Reworking may include moisture conditioning, scarifying and recompacting, or removal and replacement of in-place soil. If replacement is required, the limits of replacement shall be approved by the ENGINEER prior to removal. The ENGINEER shall randomly select additional locations for testing. A minimum of 4 additional permeability tests shall be conducted for each area of the low permeability soil to be re-tested. The CQC consultant shall perform Atterberg limits, gradation, and permeability testing on each re-tested sample, at no additional cost to the COUNTY. For areas less than 1 acre, a minimum of 1 test to verify compaction shall be conducted.

TABLE 02212-3. INITIAL TEST STRIP TESTING REQUIREMENTS

Description	Specified Value	Method	Frequency
Upon Delivery of Material:			
Percent passing No. 200 sieve	Less than 25%	ASTM D-1140 or D-421/D-422	5
Organic Content	1%	ASTM D-2974	5
Atterberg Limits:			
-Liquid Limit (percent)	20<LL<80	ASTM D-4318	5
-Plasticity Index (percent)	10<PI<40		
Moisture Content	no value	ASTM D-2216	5
Density	no value	ASTM D-698	5
Per Lift[1]:			
Thickness	6 inches[2]	None	5
Moisture Content	[3]	ASTM D-2216	5
Maximum Permeability	1.0 x $10^{-\underline{5}\cancel{7}}$ cm/sec	ASTM D-5084	5
Density	95%	ASTM D-698	5

Notes for Tables 02212-3:

[1] Lift is defined as a 6-inch compacted in-place thickness.

[2] Minimum thickness required, regardless of survey tolerances.

[3] Required range of moisture content to be determined as a result of the laboratory and test section. The anticipated moisture range is between -1 percent to +3 percent of the optimum moisture content. The minimum percent compaction shall be 92 percent of the Standard Proctor.

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TABLE 02212-4. FULL SCALE SOIL TESTING REQUIREMENTS

Description	Specified Value	Method	Frequency[1]
Percent passing No. 200 sieve	Less than 25%	ASTM D-1140 or D-421/D-422	2/acre/lift[2]
Organic Content	1%	ASTM D-2974	1/acre/lift[3]
Atterberg Limits: Liquid Limit (percent) Plasticity Index (percent)	 20<LL<80 10<PI<40	 ASTM D-4318	 1/acre/lift
Thickness	6 inches[4]	none	4/acre/lift
Moisture Content	[5]	ASTM D-2216	2/acre/lift
Maximum Permeability	$1.0 \times 10^{-\underline{5}\cancel{7}}$ cm/sec	ASTM D-5084	1/acre/lift
Density	95%	ASTM D-698	2/acre/ lift[3]
Field Moisture related to Proctor: -Nuclear Densiometer Method -Direct Heating Method -Calcium Carbide Gas Method	95%[5,6,7]	 ASTM D-3017 ASTM D-4959 ASTM D-4944	2/acre/lift
Field Density as a % of Proctor: -Drive Cylinder Method -Nuclear Densiometer Method	95%[5,6,7]	 ASTM D-2937 ASTM D-2922	2/acre/lift

Notes for Tables 02212-4:

[1] Frequency of testing is doubled for the initial 5 acres of construction.

[2] Lift is defined as a 6-inch compacted in-place thickness.

[3] And when visually change in material occurs.

[4] Minimum thickness required, regardless of survey tolerances.

[5] Required range of moisture content to be determined as a result of the laboratory and test section. The anticipated moisture range is between -1 percent to +3 percent of the optimum moisture content. The minimum percent compaction shall be 92 percent of the Standard Proctor.

[6] Nuclear, Direct Heat, and Calcium Carbide Gas Method determination of field moisture contents may be used only after correlation with laboratory results have been established. In the event of conflict, the laboratory results will govern.

[7] Nuclear determination of field density may be used only after correlation with Direct Cylinder Method have been established. In event of conflict, the Direct Cylinder Method results will govern.

[8] See Part 3.03 (F), this Section, for the necessary testing requirements to repaired or reworked areas.

[9] See Part 3.04 (A), this Section, for the necessary testing requirements of the soil backfill in confined areas.

H. If desiccation or surficial crusting occurs, the area shall be scarified to the depth necessary to expose sufficiently moist soil, and the scarified soil shall be brought to the correct moisture content, remixed and homogenized prior to recompaction. The low permeability soil shall be deemed acceptable only when it is completely free from desiccation to any depth or surficial crusting.

I. Upon completing the low permeability soil, the surface shall be visually inspected by the ENGINEER. Areas which appear to be inadequately installed will be sampled, tested, and reworked if necessary to achieve the specified properties, at no additional cost to the COUNTY. The CONTRACTOR is responsible for protecting the low permeability soil from drying, cracking or other damage until the overlying protective soil is installed.

J. A flexible membrane liner may be used as temporary protection for the completed low permeability soil. The membranes shall be overlapped 1 foot and properly anchored in place by sandbags or partial soil backfill.

K. The CONTRACTOR shall maintain the surface of the installed low permeability soil, and prevent it from becoming softened due to precipitation, desiccating and cracking due to lack of moisture, or damage by stormwater runoff erosion. The secondary geomembrane layer shall not be installed over the low permeability soil that has been damaged until repairs have been completed and the area has been approved by the ENGINEER.

L. The CONTRACTOR shall bring the final grades, elevations, and contours of the low permeability soil to within the project specifications and as indicated on the Drawings while maintaining a minimum thickness of 24 inches for the installed low permeability soil. Only when each lift of the low permeability soil has been brought to the final grades, elevations, and contours shall the tests outlined in this section be conducted.

M. Perforations, test holes and depth probes of the low permeability soil shall be over-excavated with minimum 45 degree side-slopes, and repaired by backfilling the hole with maximum 3-inch lifts of low permeability soil and bentonite powder. Each lift in the repair shall be compacted using a heavy, blunt-ended object in such a manner that the soil is well compacted, and well blended with the adjacent soil. Moisture condition the soil whenever necessary.

N. Reworked areas, at any time during the course of construction, shall be fully repaired and tested, as outlined in Table 02212-4 with the exception as specified in Part 3.03 (F), at no additional cost to the COUNTY.

O. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, re-wet as needed, rehomogenize and compact to the required density prior to further construction, at no additional cost to the COUNTY. The reworked area shall be retested, at no additional expense to the COUNTY, at the frequency specified in Table 02212-4 with the exception as specified in Part 3.03 (F). Installation of the reworked area shall be governed by the methods determined during the test section.

P. The CONTRACTOR shall be responsible for all settlement to fills and backfill areas that may occur within the maintenance period stipulated in the General Conditions.

3.04 CONFINED AREAS

A. Low permeability soils in confined areas, such as adjacent to structures or areas where heavy equipment operation is limited, shall be placed and compacted in lifts so as to meet the project specifications. Soils placed in these areas shall not have clumps exceeding 1/2 inch in any dimension. The soil shall be placed in lifts not to exceed 4 inches. The soil shall be compacted using hand tools or pneumatic mechanical devices to tamp each successive lift in place. The CQC Consultant shall define the compaction procedures with the approval of the ENGINEER. A representative density and permeability test shall be conducted by the CQC Consultant so verify the procedure.

3.05 CERTIFICATION OF COMPLETION

A. Upon completion of the low permeability soil, the CQC consultant shall certify that:

1. The low permeability soil was constructed in accordance with the approved project Drawings and specifications.

2. The low permeability soil meets all requirements of the approved project Drawings and specifications.

3. Any damage to the low permeability soil from any construction operation has been repaired as specified herein.

3.06 FINAL ACCEPTANCE

A. The CONTRACTOR shall retain the ownership and responsibility for the low permeability soil until final acceptance by the COUNTY. The CONTRACTOR is responsible for achieving the required permeability, minimum field compaction and moisture range stated in Table 02212-1 of this section. Moisture range shall be adjusted, if necessary as demonstrated by the tests section, to achieve the required permeability.

B. The low permeability soil shall be accepted by the COUNTY when:

1. All installation activities are completed.

2. All documentation of installation is completed and the CQC laboratory's final report is submitted to the ENGINEER.

3. All documents presented in Part 1.03, this Section have been submitted to the ENGINEER and approved.

- END OF SECTION -

SECTION 02220
EXCAVATION, BACKFILL, FILL AND GRADING

FLORIDA DEPARTMENT OF
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PART 1 - GENERAL

1.01 SUMMARY

A. The WORK specified in this section includes excavating, trenching, shoring, transporting, stockpiling, placing, backfilling, compacting, grading, disposing materials, field testing, and quality control/quality assurance laboratory services required for the construction as shown on the Drawings and in the Specifications.

1.02 RELATED SECTIONS

A. Section 01568 – Temporary Erosion and Sedimentation Control
B. Section 02140 – Dewatering

1.03 AVAILABLE INFORMATION

The ENGINEER has relied upon the reports listed below. The reports are available from the ENGINEER upon request, or may be reviewed at the COUNTY.

A. Envisors, Incorporated Drawings dated June 1983.
B. PSI Geotechnical Report dated March 1997.
C. PSI Soil Boring Log dated November 1997.
D. SCS Engineers Geotechnical Report dated March, 2004.

1.04 DEFINITIONS

The following definitions apply only to the terms and conditions contained within this specification.

A. Suitable Soil: Soil that meets the requirements specified in Part 2.

B. Unsuitable Soil: Soil that does not meet the requirements specified in Part 2.

C. Backfill: The suitable soil that is placed back into the Expansion and compacted after the unsuitable soils are excavated and removed. The backfill shall be free of clays and compacted to meet the specified requirements contained within these specifications.

D. CQC Consultant: Independent geotechnical consultant retained by the Contractor to perform the Construction Quality Control (CQC). The CQC Consultant shall oversee all geotechnical activities and the quality control testing services as presented in these specifications.

1.05 QUALITY CONTROL

A. Construction Quality Control (CQC) will be performed by an independent geotechnical consultant retained by the CONTRACTOR. The CQC consultant cannot be the same consultant retained by the COUNTY for Construction Quality Assurance (CQA). The CQC Consultant shall oversee all geotechnical activities and the quality control testing as specified herein. The CQC Consultant shall prepare a final report certifying the geotechnical activities performed on this project are in accordance with the Contract Documents. The final report shall be signed and sealed by a professional Engineer licensed in the State of Florida.

   1. Qualifications for the geotechnical CQC Consultant shall be submitted to the ENGINEER at least 15 calendar days prior to conducting any geotechnical laboratory or field testing related to the project. Information to be submitted is listed under Part 1.06 of this Section.

1.06 SUBMITTALS

A. Health and Safety Plan:

   1. The CONTRACTOR shall submit to the ENGINEER for review a Health and Safety Plan. The Health and Safety Plan shall include descriptions of the methods, equipment, and safety procedures to be used during construction activities, including dewatering, excavating, backfilling, and compacting. The plan shall also include response procedures for emergencies.

      a. Excavation and backfilling is planned only for areas that are not known to have buried solid waste. However, the Health and Safety Plan must also reflect that there is the possibility that various materials (municipal solid waste (MSW), industrial waste, solvents, petroleum hydrocarbons, caustics, medical wastes, animal carcasses, asbestos, etc.) may be encountered while conducting the WORK.

   2. Activities related to excavating and backfilling shall be conducted in accordance with the approved Health and Safety Plan. WORK shall be performed in compliance with all applicable Occupational Safety and Health Administration (OSHA) regulations.

   3. The CONTRACTOR shall have a Health and Safety officer, with requisite qualifications and experience, on site during all construction activities. The Health and Safety officer shall be responsible for preventing accidents at the site and shall hold weekly site safety meetings for all on-site personnel.

4. The review of the Health and Safety Plan by the ENGINEER shall be for method only. The CONTRACTOR shall retain complete responsibility for the application, adequacy and safety of the methods. However, construction shall not begin until the Health and Safety Plan has been submitted and reviewed by the ENGINEER.

B. Excavation Plan:

1. Prior to beginning WORK, the CONTRACTOR shall provide a detailed excavation plan for addressing excavation, backfilling, compacting, and grading construction.

2. Plan shall include methods of excavation, slope stabilization, shoring, dewatering, and backfilling techniques.

3. Plan shall address safety issues in consideration of OSHA, Federal, State, and local safety requirements.

4. Plan shall include temporary controls for stormwater runoff and erosion control in full conformance with all existing permits.

5. Plan shall be submitted to the ENGINEER for review and approval prior to starting construction activities.

C. For all borrow sources, the CONTRACTOR shall notify the ENGINEER in writing of the material source for each soil type specified within Part 2 of this Section at least 15 calendar days prior to the date of anticipated use of such material. Notification shall include:

1. Supplier's name.

2. Borrow location.

3. Documentation confirming adequate quantities are available for this project.

4. A representative sample of the proposed material, consisting of one 5-gallon, sealed container from each borrow location.

5. Test results for a minimum of 2 samples as required within Part 2.~~08~~ 07 of this Section. ~~Prior to conducting the consolidated-undrained Triaxial test, the~~ The CONTRACTOR shall submit to the ENGINEER the parameters for the testing equipment. Parameters include, but not limited to, ASTM test method used, sieve sizes, liquids used for permeability testing, and parameters outlined in the appropriate ASTM test method.

D. The Qualification of the geotechnical CQC Consultant shall be submitted to the ENGINEER at least 15 calendar days prior to conducting any geotechnical laboratory or field testing related to the project. The submittal shall include, at a minimum, the following information:

1. The resumes of key personnel involved in the geotechnical testing and observation activities. Key personnel shall include field personnel, laboratory personnel and immediate supervisors. The CQC Consultant shall have a minimum experience of 2 prior similar projects (landfills only) within the last 5 years.

2. Written confirmation that the project specifications have been received for the project and that WORK shall be performed in compliance with the project specifications.

3. Written confirmation that the CQC Consultant has sufficient personnel and equipment available to meet the project schedule.

E. CQC Consultant Final Report: A report shall be signed and sealed by a professional Engineer licensed in the State of Florida and submitted to the ENGINEER at the conclusion of the project which certifies the geotechnical activities performed on this project are in accordance with these specifications. At a minimum, the report shall contain:

1. Field Density Test Report (with field activity log and test location map).
2. Summary of test results from both qualifying the products and during placement.

1.07 NOTIFICATION

A. Upon identification, the CONTRACTOR shall notify the ENGINEER in writing if the site conditions encountered during construction differ from that indicated on the Drawings. Notification shall include an explicit description of the differences.

PART 2 - PRODUCTS

2.01 GENERAL FILL

A. Soil for general backfill use shall be well-drained, and free of sticks, roots, organic matter, MSW, and stones larger than 1-inch in any dimension.

B. Material shall be well-graded sand (SW), poorly graded sands (SP), silty-clayey sand (S~~M~~P-SC), or clayey sand (SC) as classified by the Unified Soil Classification System, or other soil as approved by the ENGINEER. For soils with Atterberg limits, Liquid Limit shall be less than 30 with a Plasticity index greater than 10.

2.02 STRUCTURAL FILL

Soil for structural fill use shall be well-drained, and free of sticks, roots, organic matter, MSW, and stones larger than 1-inch in any dimension. Acceptable soil types, as classified by the Unified Soil Classification System (ASTM D 2487), SP, SP-SM, SC or SP-SC or other soil as approved by the ENGINEER. For soils with Atterberg limits, Liquid Limit shall be less than 30 with a Plasticity index greater than 10.

2.03 LOW PERMEABILITY SOIL (See Section 02212)

2.04 FDOT NO. 4 ROUNDED RIVER ROCK

A. The rock placed around the leachate collection pipes shall be quartz or granite-based rounded river rock, washed and free of deleterious material.

B. The gradation shall comply with the requirements for No. 4 aggregate as specified in the Florida Department of Transportation's (FDOT), Standard Specifications for Road and Bridge Construction (2000), Section 901, Table 1, Standard Sizes of Coarse Aggregate, or other materials as approved by the ENGINEER.

2.05 GROUNDWATER COLLECTION SYSTEM ROCK

A. The rock placed around the groundwater collection pipes shall be limerock, quartz or granite-based crushed or rounded river rock, washed and free of deleterious material.

B. The gradation shall comply with the requirements for No. 4 or 57 aggregate as specified in the Florida Department of Transportation's (FDOT), Standard Specifications for Road and Bridge Construction (2000), Section 901, Table 1, Standard Sizes of Coarse Aggregate, or other materials as approved by the ENGINEER.

2.06 PROTECTIVE/DRAINAGE SOIL LAYER

A. Material shall be free of sticks and roots larger than 1-inch in any dimension, MSW, organic matter and stones. The material shall be a sand with a minimum hydraulic conductivity of $1x10^{-3}$ cm/sec, when a laboratory sample is compacted to 95 percent of the Standard Proctor, and conforming to the following gradation:

Table 02220-1

Sieve Size	Maximum Percent Passing
No. 10	100
No. 30	95
No. 50	65
No. 70	20
No. 200	0-10

The above gradation may be modified by the ENGINEER if the soil gradation varies from the gradation curve above but still meets the permeability and geotextile requirements.

2.07~~6~~ TOPSOIL

A. Material shall be fertile, natural soil, typical of the locality, free from MSW, stones (exceeding 2-inch in any dimension) roots or sticks (exceeding 1/4-inch diameter), clay, and weeds, and obtained from naturally well drained areas. It shall not be excessively acid or alkaline nor contain material harmful to plant growth. The material shall comply with the requirements of FDOT's Standard Specifications for Road and Bridge Construction (2000), Section 987 for Topsoil. Topsoil will tested for nutrient deficiencies to determine the appropriate amounts of organic material and fertilizer to be added.

2.0~~7~~8 QUALIFICATION TESTS

A. Prior to placement, soils shall be tested in accordance with Table 02220-2.

B. Composite soil samples are not allowed.

C. Testing shall be repeated each time there is a visual change in the material or upon direction of the ENGINEER.

TABLE 02220-2. SOIL QUALIFICATION TESTING

Material	Test	ASTM No.
General Fill	Standard Proctor	D 698
	Soil Classification	D 2487
	Sieve Analysis	D 422
	Atterberg Limits	D 4318
Structural Fill	Soil Classification	D 2487
	Sieve Analysis	D 422
	Atterberg Limits	D 4318
	Standard Proctor	D 698
Sub-Base	See Section 02212	
Protective/ Drainage Cover Soil	Sieve Analysis	D 422
	Hydraulic Conductivity	D 5084
Rock	Sieve Analysis	D 422
Topsoil	Soil Classification	D 2487
	Nutrient content	NA
	Organic Content	D-2974

PART 3 - EXECUTION

3.01 EXCAVATION

A. The CONTRACTOR shall conduct excavation activities according to the requirements below:

1. Layout all excavations and establish grades as shown on the Drawings. Replace existing survey markers at original location if disturbed or destroyed. Layout work shall be performed by a licensed land surveyor registered in the State of Florida.

2. Excavation, backfilling, sampling, and testing shall be performed by the CONTRACTOR only when the ENGINEER is present. A minimum of 24-hours prior notice shall be given to the ENGINEER.

3. Provide drainage at all times during construction by shaping excavated areas and maintaining ditches and drains. Protect graded areas against action of elements. Re-establish grade where settlement, washouts, or erosion damage occurs. Damaged areas shall be repaired at no additional cost to the COUNTY.

4. When excavation has reached prescribed depths, the ENGINEER shall be notified that an inspection of the excavation may be performed.

5. If the bottom of any excavation is removed below the limits shown on the Drawings or as directed by the ENGINEER, it shall be backfilled at the CONTRACTOR'S expense with material approved by the ENGINEER.

6. The CONTRACTOR shall not leave any excavations, boreholes, or trenches open at the completion of work each day. All open holes shall be backfilled flush with existing grade or covered, at the ENGINEER's direction, with acceptable material prior to leaving the site.

7. All excavations shall conform to the Health and Safety Plan submitted under Part 1.06, of this Section.

3.02 STOCKPILE OF MATERIALS

A. Excavated materials shall be transported to the stockpile areas designated by the ENGINEER. Excavated materials may be segregated during excavation and the ENGINEER shall direct locations for segregated materials. The ENGINEER shall identify materials that require segregated stockpiling.

B. The CONTRACTOR shall be responsible for vehicle traffic safety and shall coordinate with the ENGINEER to determine site-specific safety concerns.

C. The CONTRACTOR shall sweep or wash paved roadways that become covered with soil. The CONTRACTOR shall provide all equipment, water, and personnel necessary to clear the paved roads. This activity shall be performed at a minimum of once per week or as the ENGINEER directs.

3.03 PLACEMENT OF GENERAL FILL

A. Place fill materials, perform grading improvements, and construct embankments to the lines and grades shown on Drawings.

B. Materials excessively wet or dry are considered unsuitable. Allow such material to dry, or moisten, as required, to bring material generally within 3 percent of optimum moisture content range for specified compaction.

C. The surface for which the fill will be placed shall be proof-rolled a minimum of 4 complete passes with a 10-ton vibratory steel drum roller (with vibratory action turned on) or other equipment approved by the ENGINEER, prior to backfilling operations. The surface for which the fill is to be placed shall be compacted to a depth of 6-inches at the specified density. Proof-rolled area shall be accepted by the ENGINEER prior to beginning backfilling.

~~C.~~D. Place and compact soil in maximum 12-inch compacted lifts. Compaction effort shall be in accordance with Part 3.~~11~~09, this Section.

~~D.~~E. In cuts, all loose or protruding rocks on the excavated side-slopes shall be loosened and removed to line or finished grade of slope. All cut and fill slopes shall be as shown on the Drawings or as directed by the ENGINEER.

~~E.~~F. Maintain proper drainage during grading operations until final acceptance. Repair any fill or grading materials which may be lost or displaced as a result of natural causes such as storms, squalls, etc., or as a result of movement, consolidation or settlement of the ground or foundation with acceptable material. Repair shall be performed at no additional cost to the COUNTY.

3.04 PLACEMENT OF STRUCTURAL FILL

A. Place fill materials, perform grading improvements, and construct embankments to the lines and grades shown on Drawings.

B. Prior to backfilling, all unsuitable soil shall be removed, at a minimum, to the elevations shown on the Drawings. The vertical extent of the unsuitable soil is to be field verified by the CONTRACTOR.

C. The surface for which the ~~subgrade~~ fill will be placed shall be proof-rolled a minimum of 4 complete passes with a 10-ton vibratory steel drum roller (with vibratory action turned on) or other equipment approved by the ENGINEER, prior to backfilling operations. The surface for which the ~~subgrade~~ fill is to be placed shall be compacted to a depth of 6-inches at the specified density. Proof-rolled area shall be accepted by the ENGINEER prior to beginning backfilling.

D. Materials excessively wet or dry are considered unsuitable. Allow such material to dry, or moisten, as required, to bring material generally within 3 percent of optimum moisture content range for specified compaction.

E. Place and compact soil in maximum 12-inch compacted lifts. Compaction effort shall be in accordance with Part 3.~~11~~09, this Section.

F. In cuts, all loose or protruding rocks on the excavated side-slopes shall be loosened and removed to line or finished grade of slope. All cut and fill slopes shall be as shown on the Drawings or as directed by the ENGINEER.

G. Maintain proper drainage during grading operations until final acceptance. Repair any fill or grading materials which may be lost or displaced as a result of natural causes such as storms, squalls, etc., or as a result of movement, consolidation or settlement of the ground or foundation with acceptable material. Repair shall be performed at no additional cost to the COUNTY.

3.05 PLACEMENT OF SUB-BASE

A. See Section 02221.

3.06 PLACEMENT OF PROTECTIVE/DRAINAGE COVER SOIL

A. Place protective cover soil to the lines and grades shown on Drawings.

B. Place protective cover in a manner to not cause wrinkles and undue stresses in the primary geocomposite.

C. Materials excessively wet or dry are considered unsuitable. Allow such material to dry, or moisten, as required, to bring material generally within 3 percent of optimum moisture content range for specified compaction.

D. Maintain proper drainage during grading operations until final acceptance. Repair any fill or grading materials which may be lost or displaced as a result of natural causes such as storms, squalls, etc., or as a result of movement, consolidation or settlement of the ground or foundation with acceptable material. Repair shall be performed at no additional cost to the COUNTY.

3.07 PLACEMENT OF ROCK

A. Place fill materials, perform grading improvements, and construct embankments to the lines and grades shown on Drawings.

3.08 PLACEMENT OF TOPSOIL

A. Place fill materials, perform grading improvements, and construct embankments to the lines and grades shown on Drawings.

B. Materials excessively wet or dry are considered unsuitable. Allow such material to dry, or moisten, as required, to bring material generally within 3 percent of optimum moisture content range for specified compaction.

C. Maintain proper drainage during grading operations until final acceptance. Repair any fill or grading materials which may be lost or displaced as a result of natural causes such as storms, squalls, etc., or as a result of movement, consolidation or settlement of the ground or foundation with acceptable material. Repair shall be performed at no additional cost to the COUNTY.

3.09 TESTING REQUIREMENTS DURING PLACMENT

A. During placement, all materials shall be testing in accordance with Table 02220-3.

B. Composite soil samples are not allowed.

C. Density shall be a percentage of maximum dry density within 3 percent of optimum moisture content.

D. Nuclear determination of field density may be used only after correlation with Direct Cylinder Method (ASTM D 2937) has been established. In event of conflict, the Direct Cylinder Method results will govern.

E. Location of field moisture-density tests shall be approved by the ENGINEER.

TABLE 02220-3. TESTING DURING PLACMENT

Material	Test	ASTM No.	Frequency	Value
General Fill	Density	D 2937	2/acre/lift	95 percent of Standard Proctor
	Standard Proctor	D 698	Upon visual change or change in source	~~At optimum moisture~~Five Point Test
	Sieve Analysis	D 422		See ~~Table~~ 2220-2.01
	Atterberg Limits	D 4318		See 2220-2.01
Structural Fill	Density	D 2937	2/acre/lift	95 percent of Standard Proctor
	Standard Proctor	D 698	Upon visual change or change in source	~~At optimum moisture~~ Five Point Test
	Sieve Analysis	D 422		See ~~Table~~ 2220- 2.02~~1~~
	Atterberg Limits	D 4318		
Sub-Base	See Section 02221			
Protective/ Drainge Cover Soil	Sieve Analysis	D 422	1/acre	See Section 02220-2.~~05~~06
	Permeability (@95% Std Proctor)	D 5084	1/acre	1.0 x 10^{-3} cm/sec
Rock	Sieve Analysis	D422	1/10,000 cy	No. 4 or 57
Topsoil	Organic Content	D2974	1/5,000 cy	2 to 10 percent

3.10 FINAL GRADING

A. Grading in preparation of topsoil application shall be performed to the lines, grades, and elevations shown in the Drawings. All unacceptable material defined in Part 1, this Section, shall be removed and disposed of as directed by the ENGINEER.

B. All work on slopes shall be uniformly dressed to the grades shown on the Drawings.

C. The ENGINEER reserves the right to make adjustments or revisions to plans as the WORK progresses to achieve the intent of the design.

3.~~11~~11 TOLERANCES

A. The CONTRACTOR shall bring final grading to within the tolerance specified in Section 01050.

3.~~14~~12 DISPOSAL OF SURPLUS AND UNSUITABLE MATERIALS

A. No materials shall be removed from the site or disposed of by the CONTRACTOR except as directed by the ENGINEER. An on-site disposal area will be designated by the COUNTY for surplus or unsuitable materials. CONTRACTOR shall coordinate disposal activities with ENGINEER to not interfere with on-going landfill operations activities. Materials shall be placed at the designated disposal site, within the limits and to the fill heights as directed by the ENGINEER.

B. Materials shall be stored in an area of sufficient distance from excavations to not create a surcharge loading adjacent to any excavation.

3.~~15~~13 SETTLEMENT

A. The CONTRACTOR shall anticipate settlement due to consolidation associated with construction activities. The CONTRACTOR shall provide survey documentation of the settlements, if significant, to quantify volumes. The additional documentation shall be at no additional cost to the COUNTY.

3.~~16~~14 DUST CONTROL

A. The CONTRACTOR shall spray water over the construction area, haul roads, or other places impacted by the CONTRACTOR, in order to limit airborne dust, or as directed by the ENGINEER or COUNTY.

B. If due to construction activities, the dust reduces the visibility so vehicles and personnel are limited and cause an Health and Safety problem, all construction activities will be stopped immediately until the CONTRACTOR, apply water to the construction area, haul roads, or other places being impacted by the CONTRACTORS activities. The ENGINEER or COUNTY will make final decisions whether dust is a site Health and Safety problem.

- END OF SECTION -

SECTION 02776
HIGH DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE LINER

PART 1 - GENERAL

1.01 SUMMARY

A. The work specified in this Section includes manufacture, handling, transportation, storage and all equipment and labor necessary for installing, seaming, repairing, and testing the textured geomembrane as shown on the Drawings and as specified herein.

B. Geomembrane is defined as high density polyethylene (HDPE) geomembranes with a formulated sheet density greater than 0.940 g/cc. Both smooth and textured geomembrane surfaces are included under this specification. **ONLY textured geomembrane is specified for use on this project.**

C. All materials shall conform to the following requirements and be free from defects and imperfections, of recent manufacture (within 2 years prior to installation) and unused.

D. The CONTRACTOR shall coordinate the progress of geomembrane installation with excavation, grading, and protective cover soil placement.

1.02 QUALITY CONTROL/ASSURANCE

A. Construction Quality Control (CQC) will be performed by a CQC Consultant retained by the CONTRACTOR. The CQC Consultant cannot be the same company retained by the COUNTY for Construction Quality Assurance (CQA). The CQC Consultant shall review the installation plan submitted by the Installer for completeness; supervise all geomembrane installation activities and quality control testing as specified herein; and prepare a final report certifying the materials and installation are in accordance with the approved installation plan and other applicable portion of the Contract Documents.

B. Construction Quality Assurance (CQA) will be performed by an independent CQA Consultant retained by the COUNTY. The CQA Consultant shall observe and inspect the geomembrane installation activities and conduct CQA testing at a random frequency and location. The CQA Consultant shall submit a final report, signed and sealed by a professional engineer licensed in the State of Florida, certifying the test results.

C. Based upon review of the CQC and CQA final reports, the Engineer will provide certification to the regulatory agencies that the geomembrane was installed in accordance with the Contract Documents.

D. The CONTRACTOR shall schedule work to provide sufficient time as required to complete CQC and CQA field testing and documentation prior to placing any overlying layers above the geomembrane and shall keep the CQC/CQA Consultant's laboratory informed of the construction progress to provide sufficient time for laboratory testing.

1.03 QUALIFICATIONS

A. Manufacturer Qualifications: A qualified Manufacturer shall be a company, corporation, or firm regularly engaged in the development and manufacture of geomembranes with a history of successful production of geomembrane for a minimum period of 5 years. The geomembrane rolls shall be manufactured by a single Manufacturer. A company other than manufacturer may supply the geomembrane, however, the manufacturer of the geomembrane shall be required to submit and meet the requirements stated in the Section. The Manufacturer shall submit written information on the following:

1. Information on plant size (square feet of geomembrane produced daily), number of shifts, and capacity of each shift.

2. Daily production quantity shall be sufficient to meet the demands of the schedule for this WORK.

3. Quality Control program manual of descriptive documentation for production. The manual shall define sampling procedures, test frequencies and methods. The Manufacturer shall, at a minimum, comply with the quality control specification for this WORK.

4. A statement from the Manufacturer stating the manufacturing quality control measures specified for this WORK will be followed and the manufactured geomembrane products will meet or exceed the product specifications for this WORK.

5. Verification that the Manufacturer has successfully supplied geomembrane for a minimum of 6 projects in the United States, during the last 5 years, of similar size and scope totaling to a minimum of 10 million square feet of installed geomembrane. Projects shall be considered similar only if the Manufacturer had total manufacturing responsibility for geomembrane production and the installed geomembrane has successfully fulfilled its primary function for a minimum of 2 years. The Manufacturer shall submit written information as follows:

   a. Name and location of project and date of installation.

   b. Contact name and phone number for each project.

c. Geomembrane thickness and surface area of geomembrane installed.

B. Fabricator Qualifications: Qualified Fabricator shall be a company, corporation, or firm regularly engaged in the seaming and fabrication of geomembrane products, under factory-controlled conditions, for the installation of geomembrane under field conditions. The Fabricator usually seams together combinations of smaller rolls of geomembrane into larger factory panels for deployment in the field. The geomembrane shall be fabricated by a single Fabricator. The Fabricator shall submit written information on the following:

1. Information on plant size (square feet of geomembrane fabricated daily), number of shifts, and capacity of each shift.

2. Daily production quantity shall be sufficient to meet the demands of the schedule for this WORK.

3. Quality Control procedures (manual) for fabrication. The manual shall define sampling procedures, test frequencies and methods. The Fabricator shall, at a minimum, comply with the quality control specification for this WORK.

4. A statement from the Fabricator stating the fabrication quality control measures specified for this WORK will be followed and the fabricated geomembrane products will meet or exceed the product specifications for this WORK.

5. The Fabricator shall have successfully fabricated geomembrane products for at least 6 projects, during the last 5 years, of similar size and function totaling a minimum of 10 million square feet of installed geomembrane. Projects shall be considered similar only if the Fabricator had total fabrication responsibility for geomembrane production and the installed geomembrane has successfully fulfilled its primary function for a minimum of 2 years. The Fabricator shall submit written information as follows:

   a. Name and location of project and date of installation.

   b. Contact name and phone number for each project.

   c. Geomembrane thickness and surface area geomembrane installed.

C. Installer Qualifications: Qualified Installer shall be a company, Corporation, or a single Installer. The Installer shall submit written information on the following:

1. Daily installation quantity shall be sufficient to meet the demands of the schedule for this WORK.

2. Quality Control Procedures (manual) for field installation. The Installer shall, at a minimum, comply with the specifications for this WORK. If differences exist between the Installer's quality control procedures and the quality control procedures specified by the Engineer or CQA Consultant the procedures specified for the WORK shall govern installation.

3. Quality Assurance/Quality Control Field Program: The QA/QC program shall provide for recording all inspection and testing of all WORK items to ensure conformance to applicable specifications and drawings with respect to materials, workmanship, construction, functional performance and identification. The QA/QC program shall be subject to approval by the Engineer, and include:

   a. Storage and Handling (equipment).
   b. Panel Identification.
   c. Panel Inspection.
   d. Panel Layout Drawings/Shop Drawings.
   e. Seam Identification.
   f. Seaming Process and Equipment.
   g. Seaming Inspection.
   h. Non-Destructive Tests (Seams, Repairs, Geomembrane Boots).
   i. Destructive Tests.
   j. Laboratory Tests.
   k. Methods for Testing and Calibration of Field Testing Equipment.
   l. Corrective Actions (i.e., addition of geomembrane, reduction of geomembrane, topography changes).
   m. Procedures for Development of Record Drawings.
   n. Weather Contingencies.
   o. Record Keeping.

4. A statement from the Installer stating the installation quality control measures specified for this WORK will be followed and the installed geomembrane products will meet or exceed the product specifications for this WORK.

5. The Installer shall have successfully installed geomembrane products for at least 6 projects, during the last 5 years, of similar size and function totaling a minimum of 10 million square feet of installed geomembrane. Projects shall be considered similar only if the Installer had total installation responsibility for geomembrane installation and the installed geomembrane has successfully fulfilled its primary function for a minimum of 2 years. The Installer shall submit written information as follows:

   a. Name and location of project and date of installation.

b. Contact name and phone number for each project.

c. Geomembrane thickness and surface area geomembrane installed.

6. Installer's Personnel shall have the following minimum qualifications;

a. Field Installation Supervisor qualifications to be assigned to this WORK. The Field Installation Supervisor shall have directly supervised the installation of a minimum of 2,000,000 square feet of geomembrane. No geomembrane shall be installed without the presence of the Field Installation Supervisor.

b. Master Seamer Qualifications to be assigned to this WORK. All personnel performing seaming operations shall be qualified by experience or by successfully passing seaming tests. At least one seamer shall have experience seaming a minimum of 1,000,000 linear feet of geomembrane seams using the same type of seaming apparatus to be used for this WORK. No seaming shall be carried out without the presence of the master seamer within the immediate vicinity.

c. Installation quality control testing personnel in the field shall have a minimum of 400,000 square feet of geomembrane quality control testing. Only the actual square footage that the personnel have directly performed quality control testing on shall be counted as fulfillment of the minimum square footage.

D. CQC Consultant Qualifications: The CQC Consultant shall have previously performed quality control supervision totaling a minimum of 2 million square feet of installed geomembrane. The CQC Consultant may be the Installer's Supervisor or part of the Installer's company or corporation. Projects shall be considered similar only if the Installer had total installation responsibility for geomembrane installation and the installed geomembrane has successfully fulfilled its primary function for a minimum of 2 years.

1.04 SUBMITTALS

A. Thirty days prior to the delivery of the geomembrane to the site, the CONTRACTOR shall submit to the Engineer, for approval, documentation on the following:

1. Manufacturer's Qualification.

2. Fabricator's Qualification (If a Fabricator is used).

3. Installer's Qualification.

4. Warranty (Materials).

5. Geomembrane Resin Information & Quality Control Certificates.

6. Geomembrane Manufacturer material properties sheet, including at a minimum all properties specified in GRI GM 13, including test methods used & Quality Control Certificates.

7. Fabricator's Quality Control Certificates & Material Certification.

8. Geomembrane Accessories.

9. Extrudate Rod Resin Information.

10. Recommended Loading, Unloading, and Handling Equipment (include Model Number or Load Capacity).

11. A list indicating correlation between the Manufacturer's Quality Control Certificates and individual geomembrane rolls.

12. The date of shipment of geomembrane from the Manufacturer or Fabricator. A minimum of 14 days shall be given to the Engineer so as to provide sufficient time to perform conformance sampling and receive laboratory test results prior to shipment.

13. Direct Shear Test Results (interface): Direct Shear Test Results tests demonstrating compliance with Part 2.02(F).

14. Direct Shear Test Results (interface): Direct Shear Test Results tests demonstrating compliance with Part 2.02(G).

B. Installation Plan: Thirty days prior to the delivery of the geomembrane to the site, the Installer shall provide written information to the Engineer on the following (reserves the right to require changes to the installation plan): Engineer

1. Quality assurance/quality control (QA/QC) plan.

2. Description of welding equipment, techniques, and materials.

3. Panel layout plan with panel location, orientation, identification, and installed square footage of geomembrane.

4. Complete set of forms used to record installation quality assurance/quality control data.

5. Resumes of key geomembrane installation personnel. (The Field Installation Supervisor, Master Seamer, and quality control personnel shall be clearly identified).

6. Qualifications of CQC Consultant.

7. Non-destructive test methods for geomembrane seams and repairs.

8. Warranty (Workmanship).

C. Resin: Manufacturer's Quality Control Certificate, written on the Manufacturer's company letterhead, shall be provided for the raw resin material used to produce each roll of geomembrane. The frequency of the testing of the resin batches shall be per Manufacturer's quality control plan but shall not be less than 1 test per resin lot. A resin lot is defined as 180,000 pounds or less of raw resin material.

TEST	TEST METHOD
Density	ASTM D 1505
Melt Flow Index	ASTM D 1238 Cond. E

D. Sheet: Manufacturer's Quality Control Certificate, written on the Manufacturer's company letterhead, shall be provided for each roll of geomembrane, including roll identification number, and the results (Listed Individually) of quality assurance/quality control testing performed by the Manufacturer. A lot is defined as a group of consecutively numbered rolls manufactured from the same resin batch or production line. At a minimum, the following tests shall be performed at a frequency of one test per 50,000 square feet of material per lot:

TEST	TEST METHOD
Density	ASTM D 1505
Thickness	ASTM D 5199 (Smooth)
	ASTM D 5994 (Textured)
Tensile Properties	
Yield Stress	ASTM D 638 (each direction)
Yield Elongation	ASTM D 638 (each direction)
Break Stress	ASTM D 638 (each direction)
Break Elongation	ASTM D 638 (each direction)
Carbon Black Content	ASTM D 1603
Carbon Black Dispersion [1]	ASTM D 5596

Note 1 Carbon black dispersion for 10 different views: all 10 in categories 1, 2.

E. Sheet: Manufacturer's Quality Certificate, identifying the Manufacturer shall be provided for each roll of geomembrane, including roll identification number, and the results of quality assurance/quality control testing performed by the Manufacturer. A lot is defined as a group of consecutively numbered rolls manufactured from the same resin batch or production line.

TEST	TESTING FREQUENCY.	TEST METHOD
Oxidative Induction Time (OIT)	200,000 lb	ASTM D 3895 (Standard OIT) or ASTM D 5885 (High Pressure OIT)
Stress Crack Resistance[1]	per GRI-GM 10	ASTM D 5397 (Appendix)

Note 1 Stress Crack Resistance (SP-NCTL) tests on textured geomembranes can be performed on smooth samples from the same lot. Yield stress to be Manufacturer's mean value via MQC testing.

F. Sheet: Letter Certification, written on the Manufacturer's company letterhead, for the following tests and certifying the material shall meet the WORK specifications.

TEST	TEST METHOD
Puncture Resistance	ASTM D 4833
Tear Resistance	ASTM D 1004

G. Warranties from the Manufacturer and Installer. Manufacturer shall warranty the geomembrane material on a pro-rated basis for a period not less than 5 years from the date of final acceptance. The Installer shall warranty workmanship for a period of not less than 1 year from the date of final acceptance.

H. Record Drawings: The CONTRACTOR shall submit a panel layout drawing reflecting as-built conditions and related installation details (i.e., panel layout, penetrations, boots, connections) of the actual geomembrane lining system. The panel layout record drawings shall:

1. Be at the same scale as the Contract Drawings, and use applicable drafting standards including a border identifying the Installer, COUNTY project name and drawing name.

2. Indicate the installed field panel and seam numbering, configuration and dimensions, geomembrane penetrations, and berms. If applicable, factory seams shall be differentiated from field seams. The CQC Consultant shall correlate the identification numbers for each roll of material to the installation field panel.

3. Include the installed area, in square feet, of installed geomembrane.

4. Include the locations of destructive samples with the correct corresponding sample number and repairs.

I. Prior to geomembrane installation, the CONTRACTOR shall supply the Engineer with survey data that clearly indicates the grades and elevation meet the project specifications.

J. Prior to deploying the geomembrane, the Installer shall submit written documentation certifying their acceptance of the surface on which the geomembrane is to be placed.

K. If the Installer proposes to conduct seaming operations outside of the approved conditions as specified herein (i.e., outside the weather parameters or night operations), written information and supporting data verifying seam quality can be maintained shall be submitted to the Engineer for review and approval. Alternate seaming operations will not be allowed without prior approval from the Engineer.

PART 2 - PRODUCTS

2.01 GEOMEMBRANE RESIN MATERIAL

A. The geomembrane shall comprise of virgin, uncontaminated polyethylene resin designed and manufactured specifically for the purpose of liquid containment in hydraulic structures. No post consumer resin (PCR) shall be used or added to the geomembrane formulation. The resin shall contain no more than 10 percent rework of the same formulation as the parent material. The clear polyethylene resin shall meet or exceed a density of 0.932 g/cc per ASTM D 1505.

B. All compound ingredients of geomembrane shall be randomly sampled on delivery to the manufacturing facility to ensure compliance with specifications. Tests will be conducted by the Manufacturer on density (ASTM D 1505) and melt index (ASTM D 1238, Condition E), with results submitted to the CQA Consultant.

C. Any geomembrane manufactured from resin not meeting the WORK specifications shall be rejected and shall not be delivered to the project.

2.02 GEOMEMBRANE SHEET

A. For general information purposes only, Geomembrane manufacturers are GSE Lining Technology, Inc., Agru/America, Inc., Poly-Flex, Inc., or an ENGINEER-approved substitution.

B. The geomembrane materials shall conform to the physical properties requirements, at a minimum, as shown in Table 02776-1 and 2. Values presented in Table 02776-1 and 2 are based upon the minimum standards established by the Geosynthetics Research Institute (GRI) for HDPE.

C. The geomembrane shall be so produced as to be free of holes, blisters, undispersed raw materials, or any sign of contamination by foreign matter. Any such defects shall be repaired using the extrusion fusion welding technique in accordance with the Manufacturer's recommendations.

TABLE 02776-1. GEOMEMBRANE MATERIAL PROPERTIES - 60 MIL SMOOTH (NOT USED THIS PROJECT)

PROPERTY	UNIT	TEST METHOD	TEST VALUE[1]	TEST FREQUENCY (MIN)	SUBMITTAL REQUIREMENT
Resin					
Density	g/cc	ASTM D 1505	>0.932	1 per 180,000 lb	MQC Certificate, See Section 1.04
Sheet					
Thickness (min. ave.)	mil	ASTM D 5199	60	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Low Individual (any 10 values)	mil	ASTM D 5199	54	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Density, minimum	g/cc	ASTM D 1505	0.940	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Tensile Properties (Notes2,3,4)					
Yield Stress	lb/in width	ASTM D 638	126	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Yield Elongation	percent	Type IV Dumbbell	12	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Break Stress	lb/in width	Gage Length	228	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Break Elongation	percent	2.0 in/min	700	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Puncture Resistance	lb	ASTM D 4833	108	1 per lot	Letter Certificate, See Section 1.04
Tear Resistance	lb	ASTM D 1004	42	1 per lot	Letter Certificate, See Section 1.04
Stress Crack Resistance	hours	ASTM 5397, Appendix	200	1 per lot	MQC Certificate, See Section 1.04
Carbon Black Content	percent	ASTM D 1603	2.0-3.0	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Carbon Black Dispersion	Category	ASTM D 5596	1 or 2	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Oxidative Induction Time (OIT)					
Standard OIT, or	minutes	ASTM D 3895	100	1 per lot	MQC Certificate, See Section 1.04
High Pressure OIT	minutes	ASTM D 5885	400	1 per lot	MQC Certificate, See Section 1.04

Notes:
1) Test values are minimum unless otherwise noted.
2) Tensile properties shall be tested and reported separately for the Machine Direction (MD) and the Cross Machine Direction (XMD).
3) Machine Direction (MD) and Cross Machine Direction (XMD) shall be average values on the basis of 5 test specimens each direction.
4) Yield Elongation Gage Length = 33 mm; Break Elongation Gage Length = 50 mm.

TABLE 02776-2. GEOMEMBRANE MATERIAL PROPERTIES - 60 MIL TEXTURED

PROPERTY	UNIT	TEST METHOD	TEST VALUE[1]	TEST FREQUENCY (MIN)	SUBMITTAL REQUIREMENT
Resin					
Density	g/cc	ASTM D 1505	>0.932	1 per 180,000 lb	MQC Certificate, See Section 1.04
Sheet					
Thickness Min. Average	mil	ASTM D 5994	60±5%	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Low Individual (any 10 values)	mil	ASTM D 5994	54	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Density	g/cc	ASTM D 1505	>0.940	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Tensile Properties (Notes 2,3,4)					
Yield Stress	lb/in width	ASTM D 638	126	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Yield Elongation	percent	Type IV Dumbbell	12	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Break Stress	lb/in width	2.0" Gage Length	90	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Break Elongation	percent	2.0 in/min	200	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Puncture Resistance	lb	ASTM D 4833	90	1 per lot	Letter Certificate, See Section 1.04
Tear Resistance	lb	ASTM D 1004	42	1 per lot	Letter Certificate, See Section 1.04
Stress Crack Resistance	hours	ASTM 5397, Appendix	200	1 per lot	MQC Certificate, See Section 1.04
Carbon Black Content	percent	ASTM D 1603	2.0-3.0	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Carbon Black Dispersion	Category	ASTM D 5596	1 or 2	1 per 50,000 ft^2	MQC Certificate, See Section 1.04
Oxidative Induction Time (OIT)					
Standard OIT, or	minutes	ASTM D 3895	100	1 per lot	MQC Certificate, See Section 1.04
High Pressure OIT	minutes	ASTM D 5885	400	1 per lot	MQC Certificate, See Section 1.04

Notes:
1) Test values are minimum unless otherwise noted.
2) Tensile properties shall be tested and reported separately for the Machine Direction (MD) and the Cross Machine Direction (XMD).
3) Machine Direction (MD) and Cross Machine Direction (XMD) shall be average values on the basis of 5 test specimens each direction.
4) Yield Elongation Gage Length = 33 mm; Break Elongation Gage Length = 50 mm.

D. The Manufacturer shall agree to allow the COUNTY and ENGINEER to visit the manufacturing plant prior to or during the manufacturing of the geomembrane rolls for the WORK. The ENGINEER will review the manufacturing process, quality control, laboratory facilities, and testing procedures, including:

1. Verification that properties for which guarantees have been provided by the Manufacturer meets all the specifications herein.

2. Verification that the measurements of properties are properly documented and test methods used are acceptable.

3. Observe packaging and transportation procedures.

4. Verification that roll packages have a label indicating the name of the Manufacturer, type of geomembrane, sheet thickness, and roll number.

E. The geomembrane shall be packaged and shipped by the Manufacturer in a manner to protect the integrity of the geomembrane from damage.

F. Direct Shear Test (Interface Shear Resistance): The manufacturer perform one (1) direct shear test, in accordance with ASTM D5321, on representative samples of the Bi-planar Geocomposite/Geomembrane (textured) to be provided for this project. The cost for shipping and testing the samples shall be included in the price of the materials. The following testing parameters will be followed for the direct shear testing;

1. Initial Seating – Saturate (water) Geocomposite/Geomembrane for 1 hours at 2 psi.
2. Testing to be conducted under fully saturated (water) conditions.
3. Three Normal Load = 1,000, 3,000, and 6,000 psf.
4. Test Configuration: Geocomposite (bi-planar)clamped to top box
Geomembrane (textured) clamped to bottom Box
5. Strain Rate = 0.040 in/min.
6. Continue testing to ensure a full 3-inch of displacement.
7. Plot and report (Peak and Residual values) for the best fit line through each of the three test results.
8. A minimum PEAK value of 0 psf adhesion and 26.9 degrees friction is required for this project (based upon the best fit line).
9. Adhesion may be considered by the ENGINEER to determine equivalent stability for this project.

G. Direct Shear Test (Interface Shear Resistance): The manufacturer perform one (1) direct shear test, in accordance with ASTM D5321, on representative samples of the Tri-planar Geocomposite/Geomembrane (textured) to be provided for this project. The cost for shipping and testing the samples shall be included in the price of the materials. The following testing parameters will be followed for the direct shear testing;

1. Initial Seating – Saturate (water) Geocomposite/Geomembrane for 1 hours at 2 psi.
2. Testing to be conducted under fully saturated (water) conditions.
3. Three Normal Load = 1,000, 3,000, and 6,000 psf.
4. Test Configuration: Geocomposite (tri-planar)clamped to top box
   Geomembrane (textured) clamped to bottom Box
5. Strain Rate = 0.040 in/min.
6. Continue testing to ensure a full 3-inch of displacement.
7. Plot and report (Peak and Residual values) for the best fit line through each of the three test results.
8. A minimum PEAK value of 0 psf adhesion and 26.9 degrees friction is required for this project (based upon the best fit line).
9. Adhesion may be considered by the ENGINEER to determine equivalent stability for this project.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE, AND HANDLING

A. Upon delivery to the project site, the geomembrane material shall be inspected by the CONTRACTOR to confirm that proper labeling, transportation, handling, and storage procedures are followed. Damaged materials will be identified and repaired or rejected at the discretion of the ENGINEER. Materials to be repaired as specified herein. Repairs will be at no additional cost to the COUNTY. Rejected materials will be identified and removed from the project site at no additional cost to the COUNTY.

B. Each roll shall be delivered to the site bearing markings which provide the roll number, thickness of the material, length and width of the material, and the proper direction to unroll the material to facilitate layout and positioning in the field.

C. Within the installation report, the CQC Consultant shall correlate the identification numbers for each roll of material to the installation panel location.

D. The CONTRACTOR shall provide transportation, labor, and handling for delivery of the geomembrane to and from the project location. Special transportation or handling requirements required for the geomembrane shall be provided by the CONTRACTOR.

E. The equipment for transportation, handling, loading and unloading the geomembrane shall be of sufficient size and capacity to safely and efficiently handle geomembrane materials without damage or personnel injury occurring.

The type, size and capacity shall be according to Manufacturer / Fabricator / Installer requirements.

F. The CONTRACTOR shall provide all equipment and labor necessary for the loading, unloading, handling, and installation of the geomembrane.

G. The materials shall be unloaded by the CONTRACTOR in areas designated by the COUNTY. If the COUNTY has not specified a storage area, the CONTRACTOR shall determine an area for storage of the materials to meet the WORK schedule requirements. In any case the materials shall not be stored or unloaded in areas that will impair the operations of the landfill facility or be deleterious to the materials.

H. Storage requirements for the materials shall be specified by the Manufacturer / Fabricator / Installer. At a minimum, geomembrane rolls shall not be stacked upon one another to the extent that deformation of the core or flattening of the rolls occurs. Outdoor storage should not be allowed to exceed six months. For storage for more than six months a temporary enclosure shall be constructed or they should be moved to within an enclosed facility. If stored outdoors, water shall be prevented from accumulating beneath the rolls. Rolls shall be fully supported on pallets or other devices to be prevented from contacting the ground.

I. Protection shall be provided, at a minimum, from puncture, cutting, ultraviolet radiation, precipitation, dirt or other damaging or deleterious conditions.

3.02 CONFORMANCE TESTING (CQA)

A. In-Plant Conformance Sample Testing Services. The COUNTY and COUNTY'S REPRESENTATIVE have geomembrane inspectors to collect conformance samples directly at the following facilities;

GSE Lining Company, Houston, Texas
Agru-America, Kingwood, Texas

Poly-Flex, Inc., Grand Prairie, Texas

1. The MANUFACTURER shall inform, in writing, the COUNTY 14 days prior to the actual date of shipment.

2. Conformance sample(s) of the geomembrane will be collected and tested, by the COUNTY'S REPRESENTATIVE or CQA Consultant, prior to shipment to the site. Once sampled at the Manufacturer's plant, geomembrane products shall not be added or removed from the shipment.

3. If the material is shipped to the project, prior to conformance sampling at the manufacturers plant, then all cost associated with collecting and shipping samples from the project will be manufacturers responsibility.

B. Conformance Sample Test Frequency (CQA). The geomembrane shall be randomly sampled by the COUNTY'S REPRESENTATIVE at a rate of 1 sample per lot, or 1 sample per 100,000 square feet of installed material from consecutively numbered rolls, which ever is smaller. A lot is defined as a group of consecutively numbered rolls manufactured from the same resin batch or production line. The initial conformance testing shall be at the COUNTY's expense.

C. The initial conformance tests shall include the following;

1. Thickness	ASTM D-5199/ASTM D-5994
2. Carbon Black Content	ASTM D-1603
3. Carbon Black Dispersion	ASTM D-5596
4. Density	ASTM D-1505
5. Tensile Properties (each direction)	ASTM D-638

D. Samples shall be taken across the entire width of the rolls and shall not include the first three feet if stored outside or damaged. The averaged test results of the geomembrane samples shall meet or exceed the contract specifications.

E. Samples which do not satisfy the contract specifications shall be cause to reject applicable rolls. If a geomembrane sample fails to meet specifications, subsequent tests shall be performed at random on additional geomembrane samples produced from the same resin batch to determine whether all rolls produced from the same batch shall be considered as unsatisfactory and therefore rejected. This additional testing, at no additional cost to the COUNTY, may be performed to more closely identify the rolls which do not comply with the specifications. Rejected rolls will not be installed and shall be removed from the project site at no additional cost to the COUNTY.

F. The CQA Consultant will conduct one test on the actual extrudate welding rod used in the field for seaming and repairing the geomembrane panels to verify the material is compatible with the geomembrane. The tests shall consist of:

1. Density (ASTM D-1505
2. Carbon Black Content (ASTM D-1603).

3.03 GEOMEMBRANE SUBBASE

A. Surface to be lined shall be smooth and tested as shown on the Drawings. The area shall be free of all rocks (greater than 1/4- inch in any dimension), sticks (greater than 1/4-inch in diameter), roots, grass, refuse, sharp objects, or debris of any kind. The surface shall provide a firm, unyielding foundation for the geomembrane with no sudden, sharp, or abrupt changes or breaks in grade. No standing water or excessive moisture shall be allowed.

B. All areas that have been subject to erosion shall be repaired and tested in place as shown on the drawings. The repaired surface for geomembrane placement shall be even with no abrupt changes or breaks in grade. No standing water or excessive moisture shall be allowed.

3.04 GEOMEMBRANE INSTALLATION

A. Geomembrane installation shall be in accordance with the approved installation plan, and in accordance with the Drawings. Textured sheets shall be installed as shown in the Drawings.

B. Field panels shall be placed so that seams are oriented parallel to the line of maximum slope. Horizontal seams, seams perpendicular to the maximum slope, are not allowed within 5 feet of the toe of slope. When full roll lengths do not extend past the toe of slope, panel ends may be seamed provided the panel is cut at an angle greater than 45 degrees to minimize seam stress. The use of 45-degree seams along the slope shall not be allowed unless unavoidable due to the slope length and geometry.

C. Field panels shall not be placed if any of following conditions exists: inadequate geomembrane foundation, precipitation, presence of excessive moisture (i.e. fog, dew), ponded water, or presence of excessive winds.

D. The geomembrane panels shall be placed in a manner to allow for a minimum overlap of 4 inches for extrusion welding and 6 inches for fusion welding.

E. Geomembrane seams shall be welded using the double-seam hot wedge method. Extrusion welding shall be used only on those seams inaccessible with the hot wedge welder. Description and specifications for welding equipment, techniques, and materials shall be those outlined in the CQA Plan.

F. All activities by personnel and equipment in the vicinity of the geomembrane during and after geomembrane placement shall be monitored by the CONTRACTOR to insure that the geomembrane and geomembrane foundation are not damaged.

G. Temporary loading and/or anchoring shall be placed on the geomembrane to prevent uplift from the winds. The CONTRACTOR shall have sufficient sand bags or other appropriate anchoring materials on site to secure the geomembrane. CONTRACTOR shall replace or repair all geomembrane damaged (as determined by the Engineer) by wind or insufficient anchoring at no additional cost to the COUNTY.

H. Immediately prior to seaming procedures, the seam area shall be completely free of moisture, dirt, or foreign material of any kind.

I. Welding procedures shall not be allowed in the presence of any form of precipitation. Welding shall not occur when ambient air temperature measured one-foot above the geomembrane is less than 32°F or more than 104°F.

J. If seaming operations are carried out at night, written approval, by the Engineer, shall be required 24 hours in advance of the intended night operation. Adequate illumination shall be provided by the CONTRACTOR. If during the course of the night operations, the Engineer, CQA Consultant, or COUNTY decides the illumination is inadequate, proper illumination shall be provided by the CONTRACTOR or night operations shall be ceased. Contract specifications for placing and seaming the geomembrane shall apply to the night operations.

K. "Fishmouths" or wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut fishmouths or wrinkles shall be seamed and any portion where the overlap is inadequate shall then be patched with an oval or round patch of the same geomembrane extending a minimum of 6 inches beyond the cut in all directions.

L. The geomembrane shall be installed so as to minimize stresses in the sheet materials. The geomembrane shall be installed so as to conform to the contours and grade breaks. The geomembrane shall remain in contact with the underlying soils. Sand bags or excess material, placed during deployment, shall be used to prevent bridging due to temperature or installation procedures. Allowances for additional material due to temperature and installation procedures shall be included in the bid and at no additional cost to the COUNTY.

3.05 DESTRUCTIVE TESTING

A. Welding equipment shall be calibrated prior to each day's welding in accordance with the Installation Plan. The CQC Consultant shall record all calibration data for inclusion in the final report. Additional test welds shall be performed for each welding machine every 4 hours, if welder is turned off, prior to starting work, after lunch, or as directed by the CQA Consultant.

B. Destructive Seam Testing:

1. Installed geomembrane shall be tested at a rate of 1 test per 500 linear feet of welded seam at locations selected by the CQA Consultant.

2. The CQC Consultant shall remove the sample along the seam, approximately 12 inches wide across the seam by 42 inches long, and test a portion of the geomembrane seam in accordance with the CQA Plan. The location shall be recorded, repaired and tested. The repair of the

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destructive seam samples shall be at no additional cost to the COUNTY. The CQC Consultant shall deliver:

a. A 12-inch by 14-inch portion to the CQA Consultant for quality assurance testing.

b. A 12-inch by 14-inch portion shall be retained by the CQC Consultant for field testing.

c. A 12-inch by 14-inch portion to the COUNTY for archive storage.

3. Testing performed on each sample shall include geomembrane peel adhesion and seam strength. Seam peel strength and shear strength shall meet the requirements specified in Table 02776-3.

TABLE 02776-3. PEEL AND SHEAR SEAM STRENGTH VALUES

Peel Strength	ASTM D-6392
Wedge Weld (lb/in width)	98 and FTB[1,2,3]
Extrusion Weld (lb/in width)	78 and FTB[1,2,3]
Shear Strength	ASTM D-6392
Wedge Weld (lb/in width)	120 and FTB[1,2,3]
Extrusion Weld (lb/in width)	120 and FTB[1,2,3]

Notes
1. FTB =Film Tear Bond - The sheet on either side of the seam fails rather than delamination of the seam itself.
2. Delamination limited to 15 percent of the total seam length and width.
3. Both inside and outside welds to be tested and meet strength values.

4. Ten 1-inch wide strips shall be cut from the CQC Consultant's portion of the sample and these shall be tested in the field by the CQC Consultant.

5. Field Testing: The ten 1-inch wide strips shall be tested by the CQC Consultant, in the field, using a tensiometer, five for peel and five for shear, and shall meet the specifications established for this project. If any field test sample fails to pass, then the procedures outlined in 3.05 (7) shall be followed.

6. Laboratory Testing: Testing by the CQA Consultant will include Seam Strength and Peel Adhesion. A total of 5 specimens will be tested, from each sample, for each test method. All of the 5 specimens must pass the minimum pounds per inch value listed in Table 02776-3 and all specimens must separate by an FTB for each test in order for the seam to pass destructive test sampling. The results will not be averaged. Specimens will be selected alternately, by test, from the samples (i.e., peel, shear, peel, shear). The CQA Consultant will provide test results to the CONTRACTOR no more than 24 hours after the samples are received at the laboratory. The only exception shall be weekends or official holidays

when the laboratories are closed. Arrangements to schedule testing of destructive samples on weekends and holidays shall be approved by the CQA Consultant 24 hours in advance. Additional costs for lab work on holidays or weekends shall be at no additional expense to the COUNTY and shall be paid by the CONTRACTOR.

7. Procedures for Destructive Test Failure: The following procedures shall apply whenever a sample fails the destructive test, whether the test is conducted by the CQA Consultant's specified laboratory, the geomembrane CQC Consultant's laboratory, or by field tensiometer. The geomembrane Installer shall have two options, the cost of which shall be at no additional expense to the COUNTY:

   a. The geomembrane Installer can reconstruct the seam between any two passed test locations.

   b. The geomembrane Installer can trace the welding path to an intermediate location at 10 feet, minimum, from the location of the failed test in each direction, and take a specimen for an additional field test at each location. If these additional specimens pass the test, then full laboratory destructive samples shall be taken. These additional tests shall be at the expense of the CONTRACTOR. If these laboratory samples pass the test, then the seam shall be reconstructed between these locations. If either sample fails, then the process shall be repeated to establish the zone in which the seam should be reconstructed. In any case, all acceptable seams must be bounded by two locations from which samples passing laboratory destructive tests have been taken. In cases exceeding 150 feet of reconstructed seam, a sample taken from within the reconstructed zone must pass destructive testing. Whenever a sample fails, additional testing may be required for seams that were welded by the same welder and/or welding apparatus or welded during the same time shift. Such additional testing shall be at the CONTRACTOR's expense.

3.06 NON-DESTRUCTIVE TESTING

A. The CQA Consultant shall observe and test all seams and repairs by non-destructive methods. Insufficient seams shall be labeled, recorded, repaired and re-tested.

   1. Air pressure testing: shall be required for all double-seam hot wedge welds. Testing apparatus shall be capable of generating a minimum pressure of 25 pounds per square inch (psi). Air pressure gauges shall read 0 psi when testing apparatus is not turned on. Pressure gauges not reading

0 psi shall be replaced. The air channel shall be pressurized from 25 to 30 psi and allowed to stabilize. Once stabilized, the channel pressure shall be sustained for a minimum of 5 minutes. If loss of pressure is more than 2 psi, or the pressure does not stabilize, the seam shall be rejected, the faulty area located and repaired and the seam re-tested.

The following procedures shall be followed:

a. Seal both ends of the seam to be tested.

b. Insert needle or other approved pressure feed device into the tunnel created by the fusion weld.

c. Insert a protective cushion between the air pump and the geomembrane.

d. Energize the air pump to a pressure between 25 and 30 psi, close valve, allow channel pressure to stabilize, and sustain channel pressure for approximately 5 minutes.

e. If loss of pressure is more than 2 psi or does not stabilize, locate faulty area and repair.

f. After a seam has passed a pressure test, release pressure at the end of seam that is opposite the air pump and pressure gauge assembly to ensure that the seam is continuous and has been completely tested.

2. Vacuum box pressure testing: shall be required for all extrusion welds, except for those welds inaccessible to the vacuum box, such as geomembrane boots. Air pressure gauges shall read 0 psi when testing apparatus is not turned on. Pressure gauges not reading 0 psi shall be replaced. Vacuum box apparatus shall be capable of sustaining a vacuum pressure 5 psi (gauge) for 10 seconds while placed on a seam.

The following procedures shall be followed:

a. Energize the vacuum pump and reduce the tank pressure to approximately 10 inches of mercury, i.e., 5 psi gauge. All gauges shall read 0 psi when the vacuum pump is not turned on. Gauges not reading 0 psi shall be replaced.

b. Wet a strip of geomembrane approximately 4 inches by 24 inches with a soapy solution.

c. Place the box over the wetted soapy area.

d. Close the bleed valve and open the vacuum valve.

e. Ensure that a leak tight seal is created.

f. For a period of not less than 10 seconds, examine the geomembrane through the viewing window for the presence of soap bubbles, which would indicate defects in the geomembrane.

g. If no bubble appears after 10 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3 inches overlap, and repeat the process.

h. All areas where soap bubbles appear shall be marked and repaired by extrusion weld or patching.

3. Spark Testing: shall be conducted for penetrations or other difficult areas not accessible for vacuum testing, as determined by the ENGINEER and in accordance with ASTM D 6365.

   a. Equipment and Materials:

      1) 24-gauge copper wire.
      2) Low-amperage electric detector, 20,000 to 30,000 volt, with brush-type electrode capable of causing a visible arc up to ¾-inch from copper wire.

   b. Procedures:

      1) Place copper wire within ¼-inch of the edge of extrusion seam before or as the seam is being constructed.
      2) Pass electrode over seam or clamp area and observe for spark. If a spark is detected, perform a repair.

B. The CQA Consultant shall include all results from the destructive and non-destructive seam tests into the final report.

C. Alternative non-destructive test methods, such as spark testing, shall be submitted to the Engineer, for approval, prior to the start of geomembrane installation.

3.07 REPAIR PROCEDURES

A. Defects and Repairs

All seams and non-seam areas of the geomembrane shall be inspected by the CQC/CQA Consultant for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of inspection. The geomembrane surface shall be brushed, blown, or washed by the CONTRACTOR if the amount of dust, mud or debris inhibits inspection. The CQA Consultant shall decide if cleaning of the geomembrane is needed to facilitate inspection. All defects and repairs shall be at no additional expense to the COUNTY.

B. Evaluation

Each suspect location in seam and non-seam areas shall be non-destructively tested as appropriate in the presence of the CQA Consultant. Each location that fails the non-destructive testing shall be marked by the CQA Consultant and repaired accordingly.

C. Repair Procedure

1. Defective seams shall be restarted/reseamed as described in these specifications. Small holes shall be repaired by extrusion welding. If the hole is larger than 1/4 inch, it shall be patched. Tears shall be repaired by patching. The patch shall be rounded at the ends. Blisters, large holes, undispersed raw materials, and contamination by foreign matter shall be repaired by patches. Surfaces of geomembrane which are to be patched shall be abraded and cleaned no more than 15 minutes prior to the repair. No more than 10 percent of the thickness shall be removed.

2. Patches shall be round or oval in shape made of the same geomembrane and extend a minimum of 6 inches beyond the edge of defects. All patches shall be of the same compound and thickness as the geomembrane specified. All patches shall have their top edge beveled with an angle grinder prior to placement on the geomembrane. Patches shall be applied using approved methods only.

3. Sections of the double welded fusion seam failing the air pressure test shall be cap stripped. The cap strip shall cover the seam extending outward from the seam edges by 6 inches and extend the entire length of the failed seam. The cap strip may be fusion or extrusion welded over the seam.

4. Sections of the seam with insufficient overlap or without two distinct welds from the double fusion split wedge welding machine shall be cap stripped the entire length of seam lacking overlap or welds.

5. Butt seams shall be double fusion welded and air pressure tested the entire length of the seam. Small lengths, less than 10 feet in total length, of butt seam between burnouts or T-welds may be cap stripped and vacuum box tested.

D. Restart/Reseaming Procedures

The welding process shall restart by grinding the existing seam and rewelding a new seam. Welding shall commence where the grinding started and must overlap the previous seam by at least 2 inches. Reseaming over an existing seam without regrinding shall not be permitted.

E. Verification of Repairs

Each repair shall be non-destructively tested. In addition the CQA Consultant may require a destructive seam sample be obtained from a repaired seam. Repairs that pass the non-destructive and/or destructive test shall be taken as an indication of an adequate repair. Failed tests indicate that the repair shall be repeated and retested until passing test results are achieved.

3.08 ANCHOR TRENCH

A. The anchor trench shall be excavated prior to geomembrane installation, and shall be as shown on the Drawings. No loose soil roots, rocks, or materials capable of damaging the geomembrane shall be allowed beneath the geomembrane. The anchor trench shall be backfilled and compacted as indicated on the Drawings, and in a manner that prevents any damage to the geomembrane. The geomembrane shall not have sharply folded corners when placed into the anchor trench. The geomembrane shall be welded the entire length of the panel, including through the entire dimension of the trench.

3.08 OVERLYING GEOCOMPOSITE

A. During placement of geocomposite upon the geomembrane, precautions shall be taken to prevent damage to the geomembrane by restricting heavy equipment traffic. Unrolling the geotextile can be accomplished through the use of lightweight, rubber-tired equipment such as a 4-wheel all-terrain vehicle (ATV). This vehicle can be driven directly on the geomembrane, provided the ATV makes no sudden stops, starts, or turns.

B. The CONTRACTOR shall schedule his work so as to permit as much time as needed for testing and CQC/CQA documentation before placing the overlying soil layer(s). Geomembrane which is covered prior to approval by the CQA Consultant shall be uncovered at no additional cost to the COUNTY.

C. The CONTRACTOR shall place overlying geocomposite layer(s) immediately upon certification of the geomembrane by the CQA Consultant to prevent damage, uplift, or degradation of the geomembrane.

3.09 SURVEY CONTROL STAKES

In an effort to prevent damage to the geomembrane, survey stakes in the vicinity of the geomembrane shall not be allowed. Plastic traffic cones, cardboard tubes or other items as approved by the ENGINEER may be used as survey control devices.

3.10 FINAL ACCEPTANCE

B. The CONTRACTOR shall retain ownership and responsibility for the installed geomembrane until final acceptance by the COUNTY.

C. Final acceptance of the geomembrane by the COUNTY will occur when:

   1. All installation activities are completed.

   2. All documentation of installation is completed and the CQC Consultant's final report is submitted to the Engineer.

   3. All documents presented in Part 1.04, this Section, have been submitted to the Engineer and approved.

- END OF SECTION -

SECTION 02930
TRI-PLANAR GEOCOMPOSITE

PART 1 - GENERAL

1.01 SUMMARY

A. The WORK specified in this Section includes the manufacture, fabrication, testing, and installation of geocomposite (i.e., composite geonet). The Plans call for tri-planar geocomposite, which is a three-layer material comprised of an inner core of tri-planar high density polyethylene (HDPE) geonet between an upper and lower layer of non-woven geotextile. The geotextile is thermally fused to both sides of the geonet.

B. All testing specified in this section is quality control (QC) testing and is the CONTRACTOR's responsibility and all costs shall be included in the bid price. The COUNTY is responsible for the Quality Assurance (QA) testing described in the FDEP-approved CQA Plan.

1.02 MANUFACTURER'S QUALIFICATIONS

A. Single Source: All products, or components of the product, used for construction shall be obtained from a single manufacturer. Fusion of the geonet and geotextile, for each product, shall be completed by a single manufacturer.

1.03 SUBMITTALS

A. Data showing manufacturer has a minimum of 5,000,000 ft^2 of experience.

B. Product Information: The CONTRACTOR shall submit to the PROJECT MANAGER field and laboratory test data prior to importing and/or prior to any construction using the geocomposite. Submit the following information for each product 14 calendar days prior to installation, to the PROJECT MANAGER for approval:

1. Prequalification: Submit independent laboratory test results demonstrating compliance with the material properties listed in Table 02930-1, Table 02930-2, and Table 02930-3. In addition, the manufacturer must provide a certificate of compliance which states that the material to be installed will use the same manufacturing techniques, resin type, and formulation as that for which test results are submitted.

2. Transmissivity: Submit manufacturers test data that indicates transmissivity values shown in Table 02930-3 can be met at 100 hours of testing.

3. Roll Layout Drawings: Submit at a minimum, a roll layout drawing and installation details. The roll layout drawing shall be drawn to scale, and shall be coordinated with the geomembrane panel layout. Installation details shall include cross sections, temporary anchorage, anchor trenches, and other terminations.

4. Protection from Wind and Weather: Submit methodology to protect each product from wind, dirt, and direct sunlight. At a minimum, the methodology shall reflect that materials shall be shipped and stored in rolls furnished at the manufacturing facility to prevent exposure of the geotextile to ultraviolet light, precipitation, moisture, mud, dirt, dust, puncture, or other damaging conditions.

5. Rolls of products shall not be stacked upon one another to the extent that deformation of the core occurs. If stored outdoors, they shall be elevated from the ground and protected with a waterproof cover. Outdoor storage should not be allowed to exceed six months. For storage for more than six months, a temporary enclosure shall be constructed so that the geocomposite rolls are stored inside an enclosed facility.

6. Material Data: Submit complete manufacturer's specifications, descriptive drawings, and literature for each product, including the product identification and suppliers of the polymer resin and recommended method for handling and storage of all materials prior to installation. Describe the manufacturer's methodology to comply with the requirements specified for manufacturing quality control.

7. Manufacturing Quality Control: Submit a complete description of the manufacturer's formal quality control/quality assurance programs for manufacturing, fabricating, handling, installing, and testing. The description shall include, but not be limited to, polymer resin supplier and product identification, acceptance testing, production testing, installation inspection, installation techniques, repairs, and acceptance. The document shall include a complete description of methods for both roll end and roll side joining.

8. Installation Instructions: Submit samples of the product with a complete set of specifications, and manufacturer's complete written instructions for storage, handling, installation and joining.

9. Qualifications: Submit manufacturer's qualifications for each product.

10. Geonet Resin: Submit the name of the HDPE resin supplier, the production plant, the brand name, and name of resin used to manufacture the product.

11. Interface Friction Angle (ASTM D 5321), one representative test with the proposed geocomposite and the geomembrane material. Submit direct shear test results that indicate the interface friction values shown in Table 02930-3 can be achieved using the specified project materials.

12. Transmissivity Test Results (ASTM D 4716), one representative test with the proposed geocomposite and the geomembrane material. Submit transmissivity test results that indicate the values shown in Table 02930-3 can be achieved using the specified project materials.

C. Manufacturing Quality Control: The CONTRACTOR shall submit quality control test reports within 48 hours of completion of the test. Submit the following manufacturing quality control information to the QA Consultant prior to material shipment:

1. Production Dates: Submit statement of production dates for each product.

2. Test Reports: See Part 2 of this Section for tests and test frequencies.

PART 2 - PRODUCTS

2.01 GEONET

A. The geonet shall be Tendrain 770-2, as manufactured by Tenax Corporation, or a PROJECT MANAGER approved substitution.

B. The geonet shall be manufactured by extruding two sets of strands to form a structure to provide planar water flow meeting the requirements listed in Table 02930-1.

C. The geonet shall consist of new, first-quality products designed and manufactured specifically for the intended purpose designated in this specification, as satisfactorily demonstrated by prior use. The geonet shall contain stabilizers to prevent ultraviolet light degradation. The HDPE shall be unmodified HDPE containing no plasticizer, fillers, chemical additives, reclaimed polymers, or extenders. Approximately 2 percent carbon black shall be added to the resin for ultraviolet resistance. The only other allowable compound elements shall be anti-oxidants and heat stabilizers, of which up to 1.5 percent total, as required for manufacturing, may be added.

2.02 GEOTEXTILE

A. The geotextile shall meet the requirements listed in Table 02930-2.

2.03 TRI-PLANAR GEOCOMPOSITE

A. The final product material shall meet the requirements listed in Table 02930-3.

B. Manufacturer: The geocomposite shall be fabricated by heat bonding the geotextile to both sides of the geonet. No burn-through of geotextiles shall be permitted. No glue or adhesive shall be permitted. The bond between the geotextile and the geonet shall meet the requirements listed in Table 02930-3.

C. Labels: Geocomposite shall be supplied in rolls, marked or tagged with the following information:

1. Manufacturer's name.
2. Product identification.
3. Lot number.
4. Roll number.
5. Roll dimensions.

D. Roll Dimensions: The product shall be supplied as a continuous sheet with no factory seams. During installation, the roll length shall be maximized to provide the largest manageable roll for the fewest field seams.

PART 3 - EXECUTION

3.01 MANUFACTURING QUALITY CONTROL TESTING

A. All of the specified tests are the CONTRACTOR's responsibility. Testing during manufacturing shall be accomplished by the manufacturer's laboratory.

B. HDPE resin shall be tested at a frequency of one test per resin batch for compliance with Table 02930-1. One batch is defined as one rail car load of resin. The finished rolls shall be identified by a roll number corresponding to the resin batch used. The following minimum test frequencies shall be observed:

Property	Test Method	Minimum Frequency
Polymer Density	ASTM D 1505	1 per batch
Polymer Melt Index	ASTM D 1238	1 per batch

C. The geonet shall be tested during manufacturing for compliance with Table 02930-1. The following minimum test frequencies shall be observed:

Property	Test Method	Minimum Frequency
Polymer Density	ASTM D 1505	1/100,000 sf
Mass per Unit Area	ASTM D 3776	1/100,000 sf
Thickness	ASTM D 1777	1/100,000 sf

D. Geotextile shall be tested during manufacturing for compliance with Table 02930-2. The following minimum test frequencies shall be observed:

Property	Test Method	Minimum Frequency
Mass per Unit Area	ASTM D 3776	1/100,000 sf
AOS	ASTM D 4751	1/100,000 sf
Grab Tensile	ASTM D 4632	1/100,000 sf
Trapezoidal Tear Strength	ASTM D 4533	1/100,000 sf
Puncture Resistance	ASTM D 4833	1/100,000 sf

E. Upon fusion of the geotextile and geonet, the product shall be tested during manufacturing for compliance with Table 02930-3. The following minimum test frequencies shall be observed:

Property	Test Method	Minimum Frequency
Transmissivity	ASTM D 4716	1/100,000 sf
Ply Adhesion (minimum)	GRI GC7	1/100,000 sf

F. The CONTRACTOR shall inspect every roll for bonding integrity between the geonet and the geotextile. All poorly bonded and/or delaminated material shall be rejected.

3.02 FIELD QUALITY CONTROL

A. Field Joining: The CONTRACTOR shall inspect all roll end joints and roll side joints. The results of these inspections shall be documented in the daily reports. Field joints shall comply with the requirements of Table 02930-4.

B. Quality Control Reporting Procedures: All information regarding the installation of the geocomposite will be recorded in the CONTRACTOR's daily report. This information shall include:

1. Reference to product submittals, certifications, substitutions and approvals.

2. Dates of installation.

3. Location and quantity of materials installed.

4. Statement of whether materials were installed in accordance with the Technical Specifications.

5. Additional information as required.

6. All product certifications, filed appropriately for future reference.

3.03 MANUFACTURER'S RECOMMENDATIONS

A. Each Product shall be installed in accordance with the plans, specifications, and the manufacturer's recommendations. In case of a conflict between these documents, the more stringent requirements shall apply.

3.04 CLEANLINESS

A. The interface between the geocomposite and the geomembrane shall be clean, dry, and free of dirt and dust during installation. If dirt, dust, or water are present, the CONTRACTOR shall clean the work area. Products which are clogged with silts shall be discarded and shall not be installed.

3.05 ROLL JOINING METHODS

A. Table 02930-4 summarizes acceptable roll joining methods.

B. Lap Seams: The bottom layer of geotextile shall be lap seamed. Lap seaming is accomplished by overlapping adjacent geotextile a minimum of 6 inches.

C. Nylon Ties: The geonet shall be overlapped and fastened with nylon ties. Nylon ties shall be yellow or white in color to facilitate inspection.

D. Machine Sewn Seams: The top layer of geotextile shall be sewn. Sewing shall be accomplished with a lock-stitching sewing machine. The thread shall be polymeric thread which complies with manufacturer's recommendations. The seam shall be placed at a minimum of 4 inches from the geotextile edges. The finished seam shall be folded to one side.

3.06 ROLL JOINING REQUIREMENTS

A. The minimum requirements for joining rolls are specified in Table 02930-4.

B. Roll Ends: The end of each roll of geocomposite shall be overlapped a minimum of six inches. The geonet portion shall be shingled, with the uphill end overlapping the downhill end. The geonet portion shall be tied 2 feet on center at a minimum. The bottom layer of geotextile shall be overlapped a minimum of 6 inches. The upper layer of geotextile shall be machine sewn. Where the geocomposite is to terminate, the upper geotextile shall be folded over the ends with a minimum of 12 inches of geotextile placed under the geocomposite.

C. Adjacent Roll Sides: At roll sides, the material shall be overlapped a minimum of 4 inches. The bottom geotextile shall be overlapped. The geonet shall be overlapped and tied a minimum of 5 feet on center with nylon ties as described above. The upper layer of geotextile shall be machine sewn as described above.

3.07 INSTALLATION

A. The product shall be installed in accordance with the manufacturer's recommendations or as specified herein, whichever is more stringent.

B. Orientation:

1. Geocomposite shall be rolled down the slope in such a manner as to continually keep the material in tension. If necessary, the material shall be positioned by hand after unrolling to minimize wrinkles. The material shall not be unrolled laterally (i.e., across the slope).

C. The CONTRACTOR shall provide sufficient ballast and temporary anchorage to protect the product. The CONTRACTOR is responsible for protecting the product from damage due to weather at all times.

D. Physical Damage:

1. Personnel walking on the product shall not engage in activities or wear footwear that could damage the material. Smoking shall not be permitted on or near the geosynthetics.

2. Vehicular traffic shall not be permitted on the geosynthetics. Equipment shall not damage the material by handling, trafficking, or leakage of hydrocarbons. The surface shall not be used as a work area for preparing patches, storing tools and supplies, or other uses.

E. Bridging: The product shall be installed to avoid bridging.

F. Corners: In corners, where overlaps between rolls are staggered, an extra roll shall be installed from the top to the bottom of the slope.

G. Weather Protection: Each product shall be protected from direct sunlight or precipitation prior to installation. After installation this product shall not be exposed to direct sunlight and shall be covered within 30 days of installation. Product which is exposed to direct sunlight for 30 days or more shall be replaced at the CONTRACTOR's expense.

H. It is the CONTRACTOR's responsibility to provide all labor and materials for protection of the product during the period of time prior to installation of overlying soils. The CONTRACTOR's protection method is subject to the approval of the PROJECT MANAGER.

3.08 REPAIRS

A. Limitations - In general, damaged, soiled, or delaminated products shall be discarded. Products which have major damage, which require extensive repairs or replacement, shall be discarded at the CONTRACTOR's expense.

B. Minor Damage - Minor damage is defined as a hole 2 inches or smaller in diameter in the product. Minor damage shall be repaired by snipping out protruding geonet and machine sewing or thermal bonding a geotextile patch over the hole. The patch shall be a minimum of 12 inches larger than the damaged area in all directions. If thermal bonding is conducted, care shall be taken to prevent excessive heat damage to the surrounding geosythetics.

C. Major Damage - Major damage is defined as a hole larger than 2 inches in diameter through the product. Major damage shall be repaired by replacing the entire panel width.

TABLE 02930-1. GEONET PROPERTIES

Property	Qualifier	Unit	Test Method	Specified Value
Thickness	Minimum	mils	ASTM D 5199	300
Tensile Strength (machine direction)	Minimum	lbs/ft	ASTM D 4595	1200
Carbon Black	Range	percent	ASTM D 4218	2-3
Polymer Density, Resin	Minimum	g/cm^3	ASTM D 1505	0.94

TABLE 02930-2 GEOTEXTILE PROPERTIES

Property	Qualifier	Unit	Test Method	Specified Value
Fabric Weight	Minimum	oz/yd^2	ASTM D 3776	6
Grab Tensile	Minimum	lbs	ASTM D 4632	157
Puncture Resistance	Minimum	lbs	ASTM D 4833	56
Permittivity	Minimum	sec^{-1}	ASTM D 4491	0.5
AOS	Maximum	sieve size(mm)	ASTM D 4751	#70 (0.212)

TABLE 02930-3. GEOCOMPOSITE PROPERTIES

Property	Qualifier	Unit	Test Method	Specified Value
Transmissivity (Note 1)	Minimum	m^2/sec	ASTM D 4716	4.0×10^{-3}
Ply Adhesion	Average	lbs/inch	GRI GC7	1.0
Coefficient of Interface Friction w/ Geomembrane (Note 2)	Minimum	degrees	ASTM D 5321	26.9^{O}

Notes:

1. Per ASTM D 4716 with a normal stress of 5,000 psf; water at 20°C (68°F); gradient of 0.02; profile of upper load plate, soil, composite, geomembrane, and lower load plate; and a test time period of 100 hours. Apply normal stress, under saturated conditions, for 1 hour minimum prior to start of test. Test data from the manufacturer using the identical testing configuration and parameter shall indicate that transmissivity values when tested in excess of 100 hours do not fall below the minimum value of Table 02930-3. Thickness of the core geonet must be monitored during application of the normal compressive load and flow testing. Report to provide hydraulic conductivity and transmissivity. Hydraulic conductivity shall be a minimum of 10 cm/sec.

2. Interface Friction Angle (ASTM D 5321), one representative test with the proposed geocomposite and the geomembrane material. The testing criteria is as follows: The direct shear box shall be a minimum of 12 inches by 12 inches. Each normal load shall be preload at the specified normal load, for a minimum of 1 hours, prior to testing to dissipate pore pressures. Fully saturate soil prior to testing for each normal load. The specified testing Normal Stresses are 1,000, 3,000, and 6,000 psf. The strain rate is1 mm/min (0.04 in/min). The minimum PEAK interface friction angle shall be 26.9 degrees. The interface friction angle shall be the result of a linear regression line drawn continuously through the three shear strength results obtained for the normal loads specified following the procedures outlined in ASTM D 5321. Provide the results of peak and residual values. Adhesion value may be considered in determining the effective interface friction angle.

TABLE 02930-4. GEOCOMPOSITE JOINING METHODS

Location	Layer	Joining Method	Min. Overlap	Tying Frequency
Roll End (See Note 1)	Upper geotextile	Machine sewing	4"	N/A
	Geonet	Nylon ties	6"	2' on center
	Lower geotextile	Overlap	6"	N/A
Roll Side	Upper geotextile	Machine sewing	4"	N/A
	Geonet	Nylon ties	4"	5' on center
	Lower geotextile	Overlap	6"	N/A
Repair of minor damage (See Note 2)	Upper geotextile	Machine sewing/ thermal bonding	12"	N/A
	Geonet	N/A	N/A	N/A

1. At termination of geocomposite fold over upper geotextile as defined in Part 3.06.
2. Minor damage is defined in Part 3.08.

- END OF SECTION -

SECTION 02931
BI-PLANAR GEOCOMPOSITE

PART 1 - GENERAL

1.01 SUMMARY

A. The WORK specified in this Section includes the manufacture, fabrication, testing, and installation of geocomposite (i.e., composite geonet). The Plans call for bi-planar geocomposite, which is a three-layer material comprised of an inner core of bi-planar high density polyethylene (HDPE) geonet between an upper and lower layer of non-woven geotextile. The geotextile is thermally fused to both sides of the geonet.

B. All testing specified in this section is quality control (QC) testing and is the CONTRACTOR's responsibility and all costs shall be included in the bid price. The COUNTY is responsible for the Quality Assurance (QA) testing described in the FDEP approved CQA Plan.

1.02 MANUFACTURER'S QUALIFICATIONS

A. Single Source: All products, or components of the product, used for construction shall be obtained from a single manufacturer. Fusion of the geonet and geotextile, for each product, shall be completed by a single manufacturer.

1.03 SUBMITTALS

A. Data showing manufacturer has a minimum of 5,000,000 ft^2 of experience.

B. Product Information: Submit the following information for each product 14 calendar days prior to installation, to the ENGINEER for approval:

1. Prequalification: Submit independent laboratory test results demonstrating compliance with the material properties listed in Table 02931-1, Table 02931-2, and Table 02931-3. In addition, the manufacturer must provide a certificate of compliance which states that the material to be installed will use the same manufacturing techniques, resin type, and formulation as that for which test results are submitted.

2. Transmissivity: Submit manufacturers test data that indicates transmissivity values shown in Table 02931-3 can be met at 100 hours of testing.

3. Roll Layout Drawings: Submit at a minimum, a roll layout drawing and installation details. The roll layout drawing shall be drawn to scale, and shall be coordinated with the geomembrane panel layout. Installation details shall include cross sections, temporary anchorage, anchor trenches, and other terminations.

4. Protection from Wind and Weather: Submit methodology to protect each product from wind, dirt, and direct sunlight. At a minimum, the methodology shall reflect that materials shall be shipped and stored in rolls furnished at the manufacturing facility to prevent exposure of the geotextile to ultraviolet light, precipitation, moisture, mud, dirt, dust, puncture, or other damaging conditions.

5. Rolls of products shall not be stacked upon one another to the extent that deformation of the core occurs. If stored outdoors, they shall be elevated from the ground and protected with a waterproof cover. Outdoor storage should not be allowed to exceed six months. For storage for more than six months, a temporary enclosure shall be constructed so that the geocomposite rolls are stored inside an enclosed facility.

6. Material Data: Submit complete manufacturer's specifications, descriptive drawings, and literature for each product, including the product identification and suppliers of the polymer resin and recommended method for handling and storage of all materials prior to installation. Describe the manufacturer's methodology to comply with the requirements specified for manufacturing quality control.

7. Manufacturing Quality Control: Submit a complete description of the manufacturer's formal quality control/quality assurance programs for manufacturing, fabricating, handling, installing, and testing. The description shall include, but not be limited to, polymer resin supplier and product identification, acceptance testing, production testing, installation inspection, installation techniques, repairs, and acceptance. The document shall include a complete description of methods for both roll end and roll side joining.

8. Installation Instructions: Submit samples of the product with a complete set of specifications, and manufacturer's complete written instructions for storage, handling, installation and joining.

9. Qualifications: Submit manufacturer's qualifications for each product.

10. Geonet Resin: Submit the name of the HDPE resin supplier, the production plant, the brand name, and name of resin used to manufacture the product.

C. Manufacturing Quality Control: The CONTRACTOR shall submit quality control test reports within 48 hours of completion of the test. Submit the following manufacturing quality control information to the QA Consultant prior to material shipment:

1. Production Dates: Submit statement of production dates for each product.

2. Test Reports: See Part 2 of this Section for tests and test frequencies.

PART 2 - PRODUCTS

2.01 GEONET

A. The geonet shall be GSE Fabrinet, as manufactured by GSE Lining Technology, Inc., or a ENGINEER approved substitution.

B. The geonet shall be manufactured by extruding two sets of strands to form a structure to provide planar water flow meeting the requirements listed in Table 02931-1.

C. The geonet shall consist of new, first-quality products designed and manufactured specifically for the intended purpose designated in this specification, as satisfactorily demonstrated by prior use. The geonet shall contain stabilizers to prevent ultraviolet light degradation. The HDPE shall be unmodified HDPE containing no plasticizer, fillers, chemical additives, reclaimed polymers, or extenders. Approximately 2 percent carbon black shall be added to the resin for ultraviolet resistance. The only other allowable compound elements shall be anti-oxidants and heat stabilizers, of which up to 1.5 percent total, as required for manufacturing, may be added.

2.02 GEOTEXTILE

A. The geotextile shall meet the requirements listed in Table 02931-2.

2.03 BI-PLANAR GEOCOMPOSITE

A. The final product material shall meet the requirements listed in Table 02931-3.

B. Manufacturer: The geocomposite shall be fabricated by heat bonding the geotextile to both sides of the geonet. No burn-through of geotextiles shall be permitted. No glue or adhesive shall be permitted. The bond between the geotextile and the geonet shall meet the requirements listed in Table 02931-3.

C. Labels: Geocomposite shall be supplied in rolls, marked or tagged with the following information:

1. Manufacturer's name.

2. Product identification.
3. Lot number.
4. Roll number.
5. Roll dimensions.

D. Roll Dimensions: The product shall be supplied as a continuous sheet with no factory seams. During installation, the roll length shall be maximized to provide the largest manageable roll for the fewest field seams.

PART 3 - EXECUTION

3.01 MANUFACTURING QUALITY CONTROL TESTING (For Each Product)

A. All of the specified tests are the CONTRACTOR's responsibility. Testing during manufacturing shall be accomplished by the manufacturer's laboratory.

B. HDPE resin shall be tested at a frequency of one test per resin batch for compliance with Table 02931-1. One batch is defined as one rail car load of resin. The finished rolls shall be identified by a roll number corresponding to the resin batch used. The following minimum test frequencies shall be observed:

Property	Test Method	Minimum Frequency
Polymer Density	ASTM D 1505	1 per batch
Polymer Melt Index	ASTM D 1238	1 per batch

C. The geonet shall be tested during manufacturing for compliance with Table 02931-1. The following minimum test frequencies shall be observed:

Property	Test Method	Minimum Frequency
Polymer Density	ASTM D 1505	1/100,000 sf
Mass per Unit Area	ASTM D 3776	1/100,000 sf
Thickness	ASTM D 1777	1/100,000 sf

D. Geotextile shall be tested during manufacturing for compliance with Table 02931-2. The following minimum test frequencies shall be observed:

Property	Test Method	Minimum Frequency
Mass per Unit Area	ASTM D 3776	1/100,000 sf
AOS	ASTM D 4751	1/100,000 sf
Grab Tensile	ASTM D 4632	1/100,000 sf
Trapezoidal Tear Strength	ASTM D 4533	1/100,000 sf
Puncture Resistance	ASTM D 4833	1/100,000 sf

E. Upon fusion of the geotextile and geonet, the product shall be tested during manufacturing for compliance with Table 02931-3. The following minimum test frequencies shall be observed:

Property	Test Method	Minimum Frequency
Transmissivity	ASTM D 4716	1/100,000 sf
Ply Adhesion (minimum)	GRI GC7	1/100,000 sf

F. The CONTRACTOR shall inspect every roll for bonding integrity between the geonet and the geotextile. All poorly bonded and/or delaminated material shall be rejected.

3.02 FIELD QUALITY CONTROL

A. Field Joining: The CONTRACTOR shall inspect all roll end joints and roll side joints. The results of these inspections shall be documented in the daily reports. Field joints shall comply with the requirements of Table 02931-4.

B. Quality Control Reporting Procedures: All information regarding the installation of the geocomposite will be recorded in the CONTRACTOR's daily report. This information shall include:

1. Reference to product submittals, certifications, substitutions and approvals.

2. Dates of installation.

3. Location and quantity of materials installed.

4. Statement of whether materials were installed in accordance with the Technical Specifications.

5. Additional information as required.

6. All product certifications, filed appropriately for future reference.

3.03 MANUFACTURER'S RECOMMENDATIONS

A. Each Product shall be installed in accordance with the plans, specifications, and the manufacturer's recommendations. In case of a conflict between these documents, the more stringent requirements shall apply.

3.04 CLEANLINESS

A. The interface between the geocomposite and the geomembrane shall be clean, dry, and free of dirt and dust during installation. If dirt, dust, or water are present, the CONTRACTOR shall clean the work area. Products which are clogged with silts shall be discarded and shall not be installed.

3.05 ROLL JOINING METHODS

A. Table 02931-4 summarizes acceptable roll joining methods.

B. Lap Seams: The bottom layer of geotextile shall be lap seamed. Lap seaming is accomplished by overlapping adjacent geotextile a minimum of 6 inches.

C. Nylon Ties: The geonet shall be overlapped and fastened with nylon ties. Nylon ties shall be yellow or white in color to facilitate inspection.

D. Machine Sewn Seams: The top layer of geotextile shall be sewn. Sewing shall be accomplished with a lock-stitching sewing machine. The thread shall be polymeric thread which complies with manufacturer's recommendations. The seam shall be placed at a minimum of 4 inches from the geotextile edges. The finished seam shall be folded to one side.

3.06 ROLL JOINING REQUIREMENTS

A. The minimum requirements for joining rolls are specified in Table 02931-4.

B. Roll Ends: The end of each roll of geocomposite shall be overlapped a minimum of six inches. The geonet portion shall be shingled, with the uphill end overlapping the downhill end. The geonet portion shall be tied 2 feet on center at a minimum. The bottom layer of geotextile shall be overlapped a minimum of 6 inches. The upper layer of geotextile shall be machine sewn. Where the geocomposite is to terminate, the upper geotextile shall be folded over the ends with a minimum of 12 inches of geotextile placed under the geocomposite.

C. Adjacent Roll Sides: At roll sides, the material shall be overlapped a minimum of 4 inches. The bottom geotextile shall be overlapped. The geonet shall be overlapped and tied a minimum of 5 feet on center with nylon ties as described above. The upper layer of geotextile shall be machine sewn as described above.

3.07 INSTALLATION

A. The product shall be installed in accordance with the manufacturer's recommendations or as specified herein, whichever is more stringent.

B. Orientation:

1. Geocomposite shall be rolled down the slope in such a manner as to continually keep the material in tension. If necessary, the material shall be positioned by hand after unrolling to minimize wrinkles. The material shall not be unrolled laterally (i.e., across the slope).

C. The CONTRACTOR shall provide sufficient ballast and temporary anchorage to protect the product. The CONTRACTOR is responsible for protecting the product from damage due to weather at all times.

D. Physical Damage:

1. Personnel walking on the product shall not engage in activities or wear footwear that could damage the material. Smoking shall not be permitted on or near the geosynthetics.

2. Vehicular traffic shall not be permitted on the geosynthetics. Equipment shall not damage the material by handling, trafficking, or leakage of hydrocarbons. The surface shall not be used as a work area for preparing patches, storing tools and supplies, or other uses.

E. Bridging: The product shall be installed to avoid bridging.

F. Corners: In corners, where overlaps between rolls are staggered, an extra roll shall be installed from the top to the bottom of the slope.

G. Weather Protection: Each product shall be protected from direct sunlight or precipitation prior to installation. After installation this product shall not be exposed to direct sunlight and shall be covered within 30 days of installation. Product which is exposed to direct sunlight for 30 days or more shall be replaced at the CONTRACTOR's expense.

H. It is the CONTRACTOR's responsibility to provide all labor and materials for protection of the product during the period of time prior to installation of overlying soils. The CONTRACTOR's protection method is subject to the approval of the ENGINEER.

3.08 REPAIRS

A. Limitations - In general, damaged, soiled, or delaminated products shall be discarded. Products which have major damage, which require extensive repairs or replacement, shall be discarded at the CONTRACTOR's expense.

B. Minor Damage - Minor damage is defined as a hole 2 inches or smaller in diameter in the product. Minor damage shall be repaired by snipping out protruding geonet and machine sewing or thermal bonding a geotextile patch over the hole. The patch shall be a minimum of 12 inches larger than the damaged area in all directions. If thermal bonding is conducted, care shall be taken to prevent excessive heat damage to the surrounding geosythetics.

C. Major Damage - Major damage is defined as a hole larger than 2 inches in diameter through the product. Major damage shall be repaired by replacing the entire panel width.

TABLE 02931-1. GEONET PROPERTIES

Property	Qualifier	Unit	Test Method	Specified Value
Transmissivity	Minimum	m^2/sec	ASTM D 4716	2 x 10^{-3}
Nominal Thickness	Minimum	inches	ASTM D 1777	0.300
Tensile Strength (machine direction)	Minimum	lbs/in	ASTM D 5035	75
Carbon Black	Range	percent	ASTM D 1603	2-3
Polymer Density, Resin	Minimum	g/cm^3	ASTM D 1505	0.940

TABLE 02931-2 GEOTEXTILE PROPERTIES

Property	Qualifier	Unit	Test Method	Specified Value
Fabric Weight	Minimum	oz/yd^2	ASTM D 3776	6
Grab Strength	Minimum	Lbs	ASTM D 4632	170
Puncture Resistance	Minimum	Lbs	ASTM D 4833	90
Water Flow Rate	Minimum	gpm/ft^2	ASTM D 4491	110
AOS	Maximum	sieve size(mm)	ASTM D 4751	#70 (0.210)

TABLE 02931-3. GEOCOMPOSITE PROPERTIES

Property	Qualifier	Unit	Test Method	Specified Value
Transmissivity (Note 1)	Minimum	m^2/s	ASTM D 4716	2.7x10^{-3}
Ply Adhesion	Average	lbs/inch	GRI GC7	1.0
Coefficient of Interface Friction w/ Geomembrane (Note 2)	Minimum	degrees	ASTM D 5321	26.9^{O}

1. Per ASTM D 4716 with a normal stress of 5,000 psf; water at 20°C (68°F); gradient of 0.02; profile of upper load plate, soil, composite, geomembrane, and lower load plate; and a test time period of 100 hours. Apply normal stress, under saturated conditions, for 1 hour minimum prior to start of test. Test data from the manufacturer using the identical testing configuration and parameter shall indicate that transmissivity values when tested in excess of 100 hours do not fall below the minimum value of Table 02931-3. Thickness

of the core geonet must be monitored during application of the normal compressive load and flow testing. Report to provide hydraulic conductivity and transmissivity.

2. Interface Friction Angle (ASTM D 5321), one representative test with the proposed geocomposite and the geomembrane material. The testing criteria is as follows: The direct shear box shall be a minimum of 12 inches by 12 inches. Each normal load shall be preload at the specified normal load, for a minimum of 1 hours, prior to testing to dissipate pore pressures. Fully saturate soil prior to testing for each normal load. The specified testing Normal Stresses are 1,000, 3,000, and 6,000 psf. The strain rate is1 mm/min (0.04 in/min). The minimum PEAK interface friction angle shall be 26.9 degrees. The interface friction angle shall be the result of a linear regression line drawn continuously through the three shear strength results obtained for the normal loads specified following the procedures outlined in ASTM D 5321. Provide the results of peak and residual values. Adhesion value may be considered in determining the effective interface friction angle.

TABLE 02931-4. GEOCOMPOSITE JOINING METHODS

Location	Layer	Joining Method	Min. Overlap	Tying Frequency
Roll End (See Note 1)	Upper geotextile	Machine sewing	4"	N/A
	Geonet	Nylon ties	6"	2' on center
	Lower geotextile	overlap	6"	N/A
Roll Side	Upper geotextile	Machine sewing	4"	N/A
	Geonet	Nylon ties	4"	5' on center
	Lower geotextile	overlap	6"	N/A
Repair of minor damage (See Note 2)	Upper geotextile	Machine sewing/ thermal bonding	12"	N/A
	Geonet	N/A	N/A	N/A

1. At termination of geocomposite fold over upper geotextile as defined in Part 3.06.
2. Minor damage is defined in Part 3.08.

- END OF SECTION -

SECTION 15080
PIPE, FITTINGS, VALVES, AND APPURTENANCES

PART 1 - GENERAL

1.01 SUMMARY

A. The work specified in this section includes supplying, fabricating, transporting, storing, quality control/quality assurance laboratory services required for the installation of the High Density Polyethylene (HDPE) pipe, as shown on the Drawings and as specified herein, in accordance with provisions of the Contract Documents.

1.02 SUBMITTALS

A. All product (i.e., pipe, fittings, and valves) data shall be submitted, to the ENGINEER for approval, at least 15 calendar days prior to installation.

B. The CONTRACTOR shall submit to the ENGINEER the names of the pipe, pipe fitting, and valve suppliers, certificates of compliance on materials to be furnished, and manufacturer's recommendations for storage, handling, installation, inspection, and repair of each type of pipe, pipe fitting, and valve to be furnished.

C. The CONTRACTOR shall submit to the ENGINEER a manufacturer's certification that the HDPE pipe was manufactured from resins in compliance with these specifications. The certificate shall state the specific resin, its source and the specific information required by ASTM D 1248.

D. The polyethylene pipe manufacturer shall provide certification that stress regression testing has been performed on the specific product. This stress regression testing shall have been done in accordance with ASTM D 2837.

E. The manufacturer must warrant the pipe to be free from defects in material and workmanship in accordance with ASTM D 3350 and F 714.

F. Verification that CONTRACTOR's pipe welding technician has been certified by the manufacturer to conduct heat fusion connections.

PART 2 - PRODUCTS

2.01 Leachate Collection and Removal System

A. The HDPE pipe resins shall be high performance, high molecular weight, high density polyethylene (HDPE) conforming to ASTM D 1248 (Type III, Class C, Category 5, Grade P34), and ASTM D 3350 (Cell Classification PE 345434C, with material designation of PE 3408). The pipe and fittings shall be manufactured with a minimum of 2 percent carbon black to withstand outdoor exposure without loss of properties. All HDPE pipe shall meet the requirements of ASTM F-714. The pipe shall be as manufactured by Driscopipe, or be an ENGINEER approved substitution.

B. Each pipe length shall be marked with the manufacturer's name or trademark, size, material code, class, and Standard Dimension Ratio (SDR) of 11 or 17.0, as applicable.

C. All HDPE pipe and fittings shall be furnished by a single manufacturer who is experienced, reputable, and qualified in the manufacture of the items to be furnished. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same manufacturer's specification as the raw material. The pipe shall be homogenous throughout and free of visible cracks, holes, foreign inclusions, or other deleterious defects and shall be identical in color, density, melt index and other physical properties.

2.02 PERFORATIONS

A. As indicated on the Drawings.

B. As installed, the pipe shall be aligned to placed so that the perforations at the bottom of the pipe along to the trench.

2.03 VALVES AND METERS

A. Valves shall be butt fused Time Saver ™valves as manufactured by Rinker PolyPipe Materials or a ENGINEER approved substitution. The valves shall be ball type unless otherwise described in the Drawings, shall have a Viton seat and be of the line size into which they are installed.

B. Flow meter shall be electromagnetic type, 3-inch diameter, Ultra Mag Model UM-06 as manufactured by Water Specialties (distributor: Avanti (853) 453-5336) with remote mounting kit.

PART 3 - EXECUTION

3.01 TRANSPORTATION, HANDLING, AND STORAGE

A. Transportation: Care shall be taken not to cut, kink or otherwise damage the pipe material during transportation.

B. Handling:

1. Ropes, fabric or rubber-protected slings and straps shall be used when handling pipe materials.

2. Chains, cables, or hooks inserted into the pipe ends shall not be used. A sling with a spreader bar shall be used for lifting each length of pipe section. Pipe materials shall not be dropped or dragged on rocky or rough ground.

C. Storage:

1. Pipe materials shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage them in accordance with manufacturer's recommendations.

2. Stacking of the pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperature conditions.

3. Where necessary due to ground conditions, the pipe shall be stored on wooden pallets and supported to prevent deformation of the pipe.

D. Pipe material which is damaged by the CONTRACTOR shall be replaced at no additional cost to the COUNTY.

3.02 EXCAVATION AND BACKFILL

A. All excavation in the preparation of horizontal access pipe shall be performed in accordance with the requirements of Section 02220 - Excavation, Backfill, Fill and Grading.

3.03 INSTALLING HDPE PIPE AND FITTINGS

A. The installation of pipe shall be in accordance with the manufacturer's recommendations.

B. Upon satisfactory excavation of the pipe trench, pipe bedding shall be installed to provide continuous uniform support for the piping.

C. The interior of all pipes shall be thoroughly cleaned of all foreign material before being lowered in the trench and shall be kept clean during laying operations by means of caps, or other industry-approved methods.

D. Each pipe shall be carefully examined for damage (i.e., cuts, scratches, gouges) before being installed, and sections of pipe with damage exceeding manufacturer recommendations shall be replaced at CONTRACTOR's expense. Pipe shall be repaired according to manufacturer's recommendations.

E. Under no circumstances shall pipe be installed in trenches that are excessively wet or have standing water. No pipe shall be installed when trench or weather conditions are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary.

F. Cutting shall be done with approved mechanical methods in a manner that will not damage the pipe. Pipe shall be firmly and uniformly supported during cutting and fusion activities. Care shall be taken that pipe is not disturbed until joints are cured. The maximum allowable depth of cuts, scratches or gouges on the exterior of the pipe is 10 percent of wall thickness. The interior pipe surface shall be free of cuts, gouges or scratches. Sections of pipe with cuts, scratches or gouges deeper than allowed shall be removed completely and ends of the pipeline rejoined.

G. Each pipe section shall be joined in strict conformance with the pipe manufacturer's recommendations using approved equipment. Joining and installation of pipe shall be accomplished by a trained and authorized technician.

H. The CONTRACTOR shall protect the pipe and workers from the build-up of static electricity, which can be generated in the pipe by friction from the handling of pipe in storage, shipping, and installation. The CONTRACTOR shall minimize the hazard of discharge by following recommendations by the pipe manufacturer, such as applying a film of water to the work surface to drain away the static electricity.

I. When work is not being performed, the open ends of the pipe shall be closed by fabricated caps, or by other approved means. All caps shall be outside diameter fitting caps. No caps will be allowed that require insertion of the cap into the pipe. Any sediment or other contaminants allowed to enter pipe by failure to place cap over end shall be removed at CONTRACTOR's expense.

J. The ENGINEER shall be notified prior to pipe being backfilled. The ENGINEER will inspect the following items at this time:

1. All joints.
2. Pipe integrity.
3. Pipe bedding for foreign material.
4. Proper slope.
5. Trench contour to ensure the pipe will have uniform and continuous support.

Any pipe which is disturbed or found to be defective after installation shall be removed and replaced by the CONTRACTOR.

M. The termination of the pipes shall be as shown on the Drawings.

3.04 INSTALLING VALVES

A. The installation of valves and appurtenances shall be strictly in accordance with manufacturer's technical data and printed instructions, at locations shown on the drawings and as specified herein. All valves shall be butt fused into the line.

3.05 MECHANICAL CONNECTIONS

A. Mechanical connections of the HDPE pipe to auxiliary equipment through flanged connections such as manholes, shall consist of the following:

a. All stub ends and flange connections shall be thermally butt-fused to the ends of the pipe.

b. A metal back-up ring shall be ductile iron and be sized to ANSI B16.6 outside diameter and drillings.

c. Studs (Thread-rod), <u>not bolts</u>, shall be galvanized ASTM A-354 to connect flanges. All studs shall be coated, just prior to installation, with an anti-seize compound such as manufactured by Kopr-Kote or ENGINEER approved substitution.

d. Other mechanical couplings such as 360 degree full circle clamps can be used only as approved by the ENGINEER.

3.06 INTERIM CLEANING

A. Care shall be exercised during fabrication to prevent the accumulation of dirt, pipe cuttings and filings, gravel, cleaning rags, etc. within piping sections. All piping shall be examined to assure removal of these and other foreign objects prior to assembly.

3.07 FINAL CLEANING AND VIDEO INSPECTION

A. Following assembly and testing and prior to final acceptance, all pipelines installed under this section, shall be flushed with water and all accumulated construction debris and other foreign matter removed. Flushing velocities shall be a minimum of 2.5-feet per second. Cone strainers shall be inserted in the connections to attached equipment and shall remain in place until cleaning is accomplished to the satisfaction of the ENGINEER. Accumulated debris shall be removed through fittings or appurtenances.

B. Upon completion of installation, all pipes (groundwater collection system, leachate collection and detection systems) installed under this section shall be video taped by the CONTRACTOR. The video tape shall be forwarded to the Engineer.

3.09 CERTIFICATION OF COMPLETION

A. Upon completion of the covering operation over the pipe, the CONTRACTOR shall certify in writing the following to the ENGINEER:

1. The piping system has been constructed in accordance with the approved project plans and specifications.

2. The piping system has not been damaged during construction or the backfilling operation.

- END OF SECTION -

ATTACHMENT H-2

CONSTRUCTION QUALITY ASSURANCE PLAN

CQA PLAN

CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN FOR CONSTRUCTION OF THE HARDEE COUNTY EXPANSION

Prepared for:

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File No. 09199033.09
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SECTION 1

INTRODUCTION

1.1 GENERAL

This Construction Quality Assurance (CQA) Plan addresses the construction quality assurance and quality control testing, procedures and requirements for construction activities at the Hardee County Landfill. Construction activities include earthwork, piping, surveying, and installation of geosynthetic materials for the containment lining systems. The plan supplements the project plans and Specifications and has been prepared to meet requirements set forth in the Florida Administrative Code (FAC), Chapter 62-701.400.

SECTION 2

DEFINITIONS

2.1 CONSTRUCTION QUALITY CONTROL (CQC)

A planned system of inspections that is used to directly monitor and control the quality of a construction project. CQC is normally performed by the geosynthetic installer, or for natural soil materials by the Contractor, and is necessary to achieve quality in the constructed or installed system. (CQC refers to measures taken by the installer or Contractor to determine compliance with the requirements for materials and workmanship as stated in the plans and Specifications for the project.)

2.2 CONSTRUCTION QUALITY ASSURANCE (CQA)

A planned system of activities that provides the COUNTY and permitting agency quality assurance that the facility was constructed as specified in the design. CQA refers to measures taken by the ENGINEER or COUNTY to determine compliance with the requirements for materials and workmanship as stated in the plans and Specifications for the project. CQA includes construction observation and monitoring, materials testing, verifications, audits, and evaluations of materials and workmanship necessary to determine and document the quality of the constructed facility. CQA refers to measures taken by the CQA organization to assess if the installer or Contractor is in compliance with the plans and Specifications for a project.

2.3 MANUFACTURING QUALITY CONTROL (MQC)

A planned system of inspections that is used to directly monitor and control the manufacture of a material which is factory originated. MQC is normally performed by the manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the manufacturer to determine compliance with the requirements for materials and workmanship as stated in certification documents and contract plans.

2.4 MANUFACTURING QUALITY ASSURANCE (MQA)

A planned system of activities that provides assurance that the materials were constructed as specified in the certification documents and contract plans. MQA includes manufacturing facility inspections, verifications, audits and evaluation of the raw materials and geosynthetic products to assess the quality of the manufactured materials. MQA refers to measures taken by the MQA organization to determine if the manufacturer is in compliance with the product certification and contract plans for a project.

SECTION 3

QUALIFIED PARTIES AND RESPONSIBILITIES

The principal parties involved in the CQA and CQC of the facility include the Permitting Agency, COUNTY, ENGINEER, CQA Consultant, Contractor, Soils CQA Laboratory, Geosynthetics Manufacturer, Geosynthetics Installer, and Geosynthetics Laboratory. The general responsibilities of each of these parties is described in the following subsections. The responsibility and/or authority of a given party may be modified or expanded as dictated by specific needs as construction progresses.

3.1 PERMITTING AGENCY

The Permitting Agency is authorized to issue the permit for construction based on review and acceptance of the permit application. The Permitting Agency must have issued a permit for the project prior to the commencement of construction. As construction progresses, the Permitting Agency has the responsibility and authority to review and accept design revisions or requests for variance submitted by the COUNTY.

3.2 COUNTY

The COUNTY is responsible for the facility, including coordinating the design and construction of the landfill features. This responsibility includes compliance with the permit and the submission of CQA documentation demonstrating that the facility was constructed in accordance with the permit documents and the design plans and Specifications.

The COUNTY has the authority to contract and manage parties charged with design, CQA, and construction activities. The COUNTY also has the authority to accept or reject design plans and Specifications, CQA plans, reports, and recommendations of the CQA Consultant, and the materials and workmanship of Contractors.

3.3 ENGINEER

The ENGINEER is responsible for the preparation of the design, including Drawings, plans and project Specifications for construction, and this CQA plan.

The ENGINEER is responsible for performing the engineering design and preparing the associated Drawings and Specifications and for approving all design and Specification changes and making design clarifications necessitated during construction. The ENGINEER shall be a professional skilled in the appropriate discipline, certified or licensed as required by regulation. The ENGINEER shall be familiar with the construction details and applicable regulatory requirements.

3.4 CQA CONSULTANT

The CQA Consultant is a party independent of the Contractor(s), Geosynthetic Manufacturer or Installer, and is responsible for field testing, observing, and documenting activities related to the construction and/or permit documents and the CQA Plan. The CQA Consultant is represented on-site by the CQA monitoring personnel and supporting on-site CQA monitoring personnel as appropriate. In general, the responsibilities and authorities of the CQA Consultant include:

- Understanding the permit documents, design plans, and Specifications in relation to all aspects of the CQA Plan.

- Scheduling, coordinating, and performing CQA activities.

- Performing independent on-site observation of the work in progress to assess compliance with the CQA Plan, permit documents, design plans and Specifications.

- Reporting deviations from the CQA Plan, permit documents, design plans and/or Specifications to the COUNTY. Secure documents from the COUNTY which approve the changes.

- Verifying that the Installer's test equipment meets testing and calibration requirements, and that tests are conducted according to procedures defined in the CQA Plan.

- Recording and maintaining test data.

- Verifying that corrective measures are implemented.

- Documenting and reporting CQA activities, and collecting data needed for record documentation, including photographs.

- Maintaining open lines of communication with other parties involved in the construction.

- Preparing the Final Documentation Report, complete with certification statements.

3.5 CONTRACTOR

The Contractor is responsible for excavation of soil and rock, and placement and compaction of the soil and aggregate materials using procedures and equipment necessary to produce the results in conformance with the Contract Documents. The Contractor may also be responsible for the preparation and completion of anchor trenches, dewatering, and other site-specific responsibilities as required by the Contract Documents.

3.6 GEOSYNTHETICS MANUFACTURER

The Geosynthetics Manufacturer(s) is responsible for the production of geosynthetics including geomembranes, geonets, geotextiles, geocomposites, geosynthetic clay liners (GCL) and geogrids which meet the requirements in the Specifications. The Geosynthetics Manufacturer is responsible for providing adequate documentation regarding the characteristics of the raw material, final product, the testing performed to verify the characteristics and the MQC measures taken during manufacturing.

The Geosynthetics Manufacturer(s) is responsible for the transportation of the geosynthetics from the manufacturing plant to the site. The Geosynthetics Manufacturer(s) is responsible for loading and transporting geosynthetics, and for damage to the geosynthetics which may occur during these operations.

3.7 GEOSYNTHETICS INSTALLER

The Geosynthetics Installer is responsible for unloading, field handling, storing, seaming, temporarily loading against wind and other aspects of the geosynthetics installation in accordance with this CQA plan and the Specifications.

The Geosynthetics Installer is responsible for the preparation of the panel layout drawing including dimensions and details, and for providing the installation schedule and a list of proposed field personnel and their qualifications. During installation, the Geosynthetics Installer is responsible for providing CQC documentation and subbase acceptance certificates. Upon completion of the installation, the Geosynthetics Installer shall provide the geomembrane documentation, the Manufacturer's warranty, and the installation warranty.

3.8 CQA GEOSYNTHETICS LABORATORY

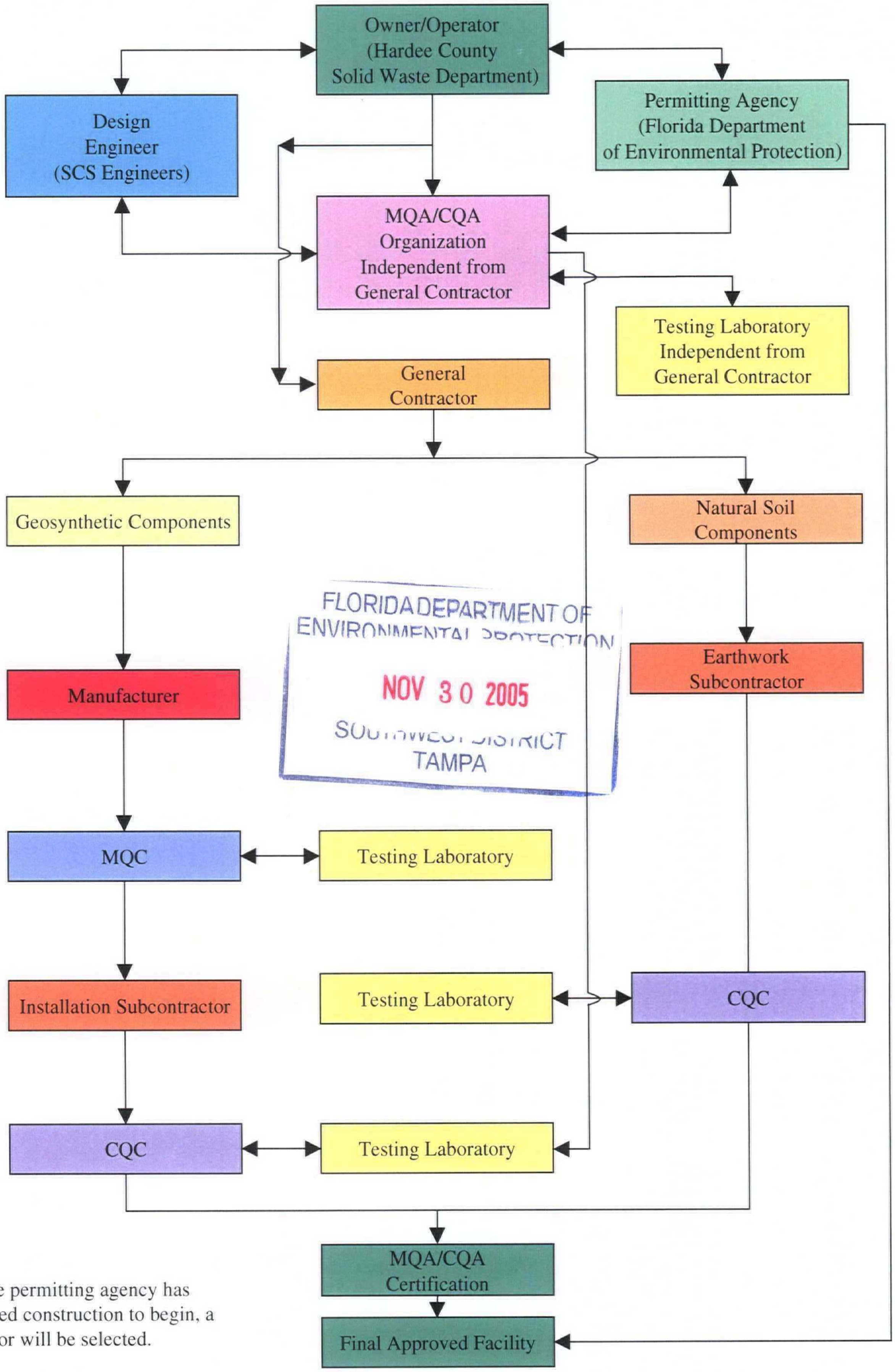
The CQA Geosynthetics Laboratory is responsible for performing the laboratory tests on geosynthetic materials as required by the Specifications. The CQA Geosynthetics Laboratory is also responsible for providing documentation of testing equipment used, analytical results and test methods followed. All results should be reported to the CQA Consultant.

3.9 CQA SOILS LABORATORY

The CQA Soils Laboratory is responsible for performing the laboratory testing on soils and aggregate required by the CQA Manual and for providing documentation of analytical results, test methods followed, and testing equipment used. Work schedules and tests of the CQA Soils Laboratory should be reported to the CQA Consultant.

3.10 CQC SOILS LABORATORY

The CQC Soils Laboratory is responsible for performing the laboratory testing on soils and aggregate required by the CQA Manual and for providing documentation of analytical results, test methods followed, and testing equipment used. Work schedules and tests of the CQC Soils Laboratory should be reported to the Contractor and CQA and CQC Consultants.



Note
After the permitting agency has authorized construction to begin, a contractor will be selected.

Figure 1 - Organizational Structure of MQA/CQA Inspection Activities

SECTION 4

COMMUNICATIONS AND MEETINGS

Continuous communications between parties involved in the construction and CQA of this project, including the COUNTY, Engineer, Contractor, Geosynthetics Manufacturer, Geosynthetics Installer, CQA/CQC Consultant, and Permitting Agency, coupled with regularly scheduled meetings are necessary components of this plan. Such communication and meetings are intended to resolve construction quality and design issues as early as possible, to keep all parties informed of schedules, and verifying that the work is proceeding in accordance with Specifications, schedules and this CQA plan. At a minimum there should be a Pre-Construction Meeting, regular Progress Meetings, and Construction Resolution Meetings, as described below:

4.1 PRE-CONSTRUCTION MEETING

The Pre-Construction Meeting shall be held at least 1 week prior to start of construction and should be attended, at a minimum, by the COUNTY, Engineer, Geosynthetics Installer superintendent, the CQA Consultant, and the Contractor and surveyor. Specific topics at this meeting include, but are not limited to:

- Introduction of all personnel and review the responsibilities of each party, establish project communication, and delineate authority.
- Review the time schedule for construction, including material shipment and working hours.
- Review methods for documenting and reporting, and for distributing documents and reports.
- Establish protocols for testing, handling deficiencies, repairs, and retesting.
- Review seam testing and repair procedures, layout and numbering systems for panels and seams.
- Establish rules for writing on the geomembrane, i.e., who is authorized to write, what can be written and in what color.
- Outline procedures for packaging and storing archive samples.
- Establish locations for soil and geosynthetic materials stockpile.
- Review status of required submittals from Geosynthetics Installer and Contractor.

- Review project specific permit requirements.

The Engineer or County shall record and distribute the meeting minutes to all parties involved.

4.2 PROGRESS MEETINGS

Progress Meetings shall be held at a mutually agreed upon day and time, usually once a week, and attended by representatives of the Geosynthetics Installer, Contractor, CQA Consultant, COUNTY, Engineer, and other parties that may be involved in specific activities occurring at that period of time. Meeting minutes shall be prepared by the CQA Consultant and distributed to all parties in attendance in addition to the established distribution list for project communications.

Topics for the Weekly Progress Meetings shall include, but are not limited to:

- Work progress to date, and scheduled activities for the subsequent week(s).
- Review of construction issues including questions on Specifications, design, materials test results, test failures, retests, procedures, weather conditions, working hours, holidays, communications, minutes from previous meetings, problems and resolutions, documentation, Material Quality Control (MQC) certificates, and other project related topics.

4.3 CONSTRUCTION RESOLUTION MEETINGS

In some cases, construction issues or problems arise that demand specific attention outside of the regular Progress Meetings, and may include parties not available at regular Progress Meetings. Such meetings shall be held as necessary to resolve construction problems or issues in a timely manner so that work can proceed. To the extent possible, these meetings shall be scheduled such that the key parties are available. Meeting minutes shall be prepared by the County and Engineer, and distributed to the established distribution list for project communications.

SECTION 5

EARTH MATERIAL QUALITY ASSURANCE

5.1 GENERAL

This section of the plan describes CQA procedures for earth material (e.g. soil and rock) components of the project. CQC testing and Contractor installation requirements are outlined in the project Specifications.

5.2 TESTING PROGRAM

The two categories of quality assurance testing covered in this plan include Pre-Construction Testing and Construction Testing. Within these categories, quality assurance testing shall consist of the following:

- Material Evaluation.
- Construction Quality Evaluation.
- Special Testing.

5.3 MATERIAL EVALUATION

Pre-construction material evaluations shall be performed on samples from potential soil borrow sources to ascertain their acceptability as construction materials. Construction testing shall be performed during the course of the work to verify material compliance with the project Specifications. Unless otherwise indicated in the project Specifications the following tests shall be performed:

- Natural moisture content (ASTM D 2216).
- Particle Size Analysis (ASTM D 422).
- Atterberg Limits (ASTM D 4318).
- Proctor Compaction Test (ASTM D 698 (Standard) or D 1557(Modified)).

Criteria to be used for determination of acceptability of earth materials for use during construction shall be as defined in the project Specifications. All evaluation tests are to be performed in the CQA Soils Laboratory that has been approved for use by the COUNTY Engineer. Test reports will verify compliance with or state deviation from the applicable ASTM Standards or other accepted standards as outlined in the Specifications.

All soil materials shall meet or exceed the project Specifications.

5.3.1 Hydraulic Conductivity Evaluations

Hydraulic conductivity evaluations shall be conducted on materials proposed for use in the construction of the low permeability soil layer and sand drainage layers. Acceptance criteria of low permeability soils based on measured values of hydraulic conductivity shall be based on project Specifications. Tests may be performed using laboratory equipment and methods that are suitable for the soil type. High permeability materials, such as gravels and sands may be tested using constant head methods in rigid wall or flexible wall permeameter. Low permeability materials such as clays and silts may also be tested in rigid or flexible wall permeameters using falling head methods, provided that sample preparation is performed carefully.

In situ hydraulic conductivity tests methods may be employed to measure test fills as described below.

5.3.2 Low Permeability Soil

Prior to construction of the low permeability soil liner, a test fill (or small-scale test pad) may be constructed to verify that the soil liner material, compaction equipment, and construction methods can produce a liner that meets hydraulic conductivity requirements as indicated in the Specifications. The test fill will be useful in the evaluation of equipment, procedures, soil density and moisture content as related to hydraulic conductivity, and possibly reduce the number of field samples or penetrations that are taken in the constructed soil liner. By monitoring field density, moisture content, degree of saturation at placement, and field and laboratory hydraulic conductivity, the relationship between these factors can be ascertained for use in evaluation of the soil liner construction. This information will also be useful for the Contractor to determine if areas are likely to meet hydraulic conductivity requirements prior to completion of laboratory or field conductivity testing. Other factors such as clod size, compactive effort, soil plasticity and grain-size distribution are also useful in development of these relationships.

Testing procedures for the test fill are outlined in the Specifications. In general, the test fill is built to the same specifications as the soil liner, and may constitute a portion of the actual soil liner, except that more frequent testing is required.

Successful hydraulic conductivity testing within the test fill using the Two-Stage Borehole procedures as described by Boutwell (1992), or other similar field method, may preclude the need to perform field hydraulic conductivity testing within the soil liner. This will allow the Geosynthetics Installer to proceed with geomembrane placement as soon as the soil liner has been completed, which reduces the possibility that the exposed soil liner will be negatively impacted by weather conditions while the tests are underway.

5.3.3 Drainage Soil Testing

Prior to the installation of the drainage soil, the Contractor or CQC Consultants shall provide the test results on the soil, as required by the project specifications, to the County or Engineer for approval. Upon receipt to the test information, the CQA Consultant will collect one random sample from the material delivered to the site and test it for gradation and permeability.

5.3.4 General Fill Soil Testing

Prior to the installation of the general fill, the Contractor or CQC Consultants shall provide the test results on the soil, as required by the project specifications, to the County or Engineer for approval. Upon receipt to the test information, the CQA Consultant will collect one random sample from the material delivered to the site and test it for gradation, atterberg limits, and a proctor test.

5.3.5 Structural Fill Soil Testing

Prior to the installation of the structural fill, the Contractor or CQC Consultants shall provide the test results on the soil, as required by the project specifications, to the County or Engineer for approval. Upon receipt to the test information, the CQA Consultant will collect one random sample from the material delivered to the site and test it for gradation, atterberg limits, a proctor test, and conduct one LBR (limerock Bearing Ratio) test on the material.

5.4 CONSTRUCTION QUALITY EVALUATION

Construction quality evaluation shall be performed on all soil components of the construction. These evaluations shall be performed at the frequencies indicated in the Specifications. Criteria to be used for determination of acceptability of the construction work shall be as identified in the project Specifications.

Construction evaluation testing includes the visual observations of the work, layer bonding, and clod sizes; in-place density/moisture content testing; surveys of as-built conditions and elevations; thickness monitoring; and special testing. Observations of the construction work shall include the following:

- Clod size and other physical properties of the soil during processing, placement and compaction.
- Thickness of lifts as loosely placed and as compacted.
- Action of the compaction equipment on the construction surface (sheepsfoot penetration, pumping, cracking, etc.).
- Procedures used to prevent desiccation and/or freezing of completed lifts and layers.

Determinations of in-place moisture and density shall be performed in accordance with the Specifications.

5.4.1 <u>Deficiencies</u>

If defects are discovered in the earthwork, the extent and nature shall be evaluated by the CQA Consultant. If a defect is indicated by a failing test, the CQA Consultant shall determine the limits of the affected area by additional tests, observations, a review of records, and other means deemed appropriate. If the defect is related to adverse site conditions, the CQA Consultant shall define the limits and nature of the defect.

5.4.2 <u>Notification</u>

The CQA Consultant shall notify the COUNTY and Contractor after determining the nature and extent of the defect. Appropriate retests shall be scheduled by the CQA Consultant when the work deficiency is corrected.

5.4.3 <u>Repairs and Retesting</u>

Deficiencies shall be corrected by the Contractor to the satisfaction of the CQA Consultant. The CQA Consultant shall also verify that all installation requirements have been met and that all submittals are provided.

5.5 SPECIAL TESTING

Special testing to determine the acceptability of materials shall be conducted at the direction of the COUNTY, the Engineer or their representative. Criteria to be used for the determination of acceptability shall be as established by the COUNTY, the Engineer or their representative.

SECTION 6

GEOSYNTHETIC MATERIAL QUALITY ASSURANCE

6.1 GEOMEMBRANES

This quality assurance testing program has been established to verify that specified geomembranes are manufactured, installed and tested according to the project Specifications.

6.1.1 Manufacturer Quality Control Documentation

The Geomembrane Manufacturer shall provide documentation and certification that the material meets the requirements outlined in the Specifications and that adequate quality control measures have been implemented during the manufacturing process.

The following should be provided prior to shipment of the geomembrane:

- A properties value certification including at a minimum, guaranteed values for all geomembrane properties required by the Specifications.
- An inventory list of quantities with descriptions of materials which comprise the geomembrane shipment(s).

The CQA Consultant shall verify that the property values certified by the Geomembrane Manufacturer meet the test methods listed in of the Specifications and Manufacturer's guaranteed minimum values.

6.1.2 Manufacturer's Quality Control Certificate

Prior to shipment, the Geomembrane Manufacturer shall also provide the CQA Consultant with quality control certificates for the geomembrane, signed by a responsible party employed by the Geomembrane Manufacturer. The Manufacturer shall be required to perform, at a minimum, the tests listed in the Specifications.

The CQA Consultant shall review the certificates and verify that the quality control certificates have been provided at the specified frequencies for all materials and rolls. The CQA Consultant shall also review the quality control certificates and verify that the test methods meet the requirements included in the Specifications and the Manufacturer's guaranteed minimum values which were provided prior to shipment.

6.1.2.1 Delivery and Storage--

Upon delivery to the site, visual inspection by the Installer and the CQA Consultant shall be conducted on all rolls for evidence of defects or damage. This inspection shall be done without unrolling the rolls unless damage or defects are detected.

During or following this visual inspection, the CQA Consultant, with the assistance of the Installer or Contractor, shall remove samples to be tested for conformance with the Specifications.

The Installer shall be responsible for the storage of the geomembranes on-site. The storage space shall provide protection from theft, vandalism, and traffic. The storage location shall be such that exposure to environmental factors, construction activities and handling are minimized.

6.1.2.2 Conformance Sampling and Testing--

The CQA Consultant shall obtain the required number of conformance test samples from the geomembrane upon delivery to the site. These samples shall be sent to the CQA Geosynthetics Laboratory for testing to verify conformance to the values listed in the Specifications. These tests shall be performed prior to installation.

Samples shall be selected by the CQA Consultant and shall not include the first complete revolution. The sample shall be a minimum four feet, as measured along the width of the roll, and extend three feet along the roll. Samples shall be taken at a rate of one per lot, but at a rate not less than one conformance test per 100,000 square feet or portion thereof.

Prior to the deployment of the geomembrane, the CQA Consultant shall review all conformance test results and report any nonconformance to the COUNTY. The CQA Consultant shall be responsible for verifying that all the test results meet or exceed the property values listed in the Specifications.

If failing test results may be the result of the sampling process or due to the CQA Geosynthetics Laboratory incorrectly conducting the test, the Manufacturer may request a retest to be conducted at the CQA Geosynthetics Laboratory in the presence of a representative of the Manufacturer.

All material from a lot represented by a failing test result shall be rejected, or additional conformance test samples may be taken to isolate the portion of the lot not meeting Specifications (this procedure is valid only when rolls in a lot are consecutively produced and numbered from one manufacturing line). Additional samples shall be taken from rolls either side of the failing roll, until passing test results are achieved, to establish the range of failure within the lot. All rolls lying within this range of failure shall be rejected.

6.1.3 Subgrade Preparation and Acceptance

The Contractor shall be responsible for preparing the subgrade upon which the geomembrane will be placed according to the Specifications.

Prior to acceptance, the CQA Consultant shall verify that:

- A qualified land surveyor has verified all lines and grades.
- The supporting soil meets the density and moisture Specifications, and provides a firm, unyielding foundation.
- The surface to be lined is relatively smooth and free of stones, protrusions, irregularities, roots, loose soil, abrupt changes in grade, or other conditions that may puncture or abrade the geomembrane.
- There is no standing water or areas excessively softened by high moisture content, large desiccation cracks.
- All subgrade density, moisture content, hydraulic conductivity tests, or other tests have been completed and meet Specification requirements, and that no other tests are necessary.

The Installer shall certify, in writing, that the surface on which the geomembrane will be installed is acceptable. A Certificate of Acceptance shall be given by the Installer to the CQA Consultant prior to commencement of geomembrane installation in the area under consideration and a copy of this certificate provided to the COUNTY.

After the supporting soil has been accepted by the Installer, it shall be the Installer's responsibility to indicate to the CQA Consultant any change in the supporting soil condition that may require correction. If the CQA Consultant concurs with the Installer, then the COUNTY shall ensure that the supporting soil is repaired.

6.1.4 Subgrade Repair

At any time during the geomembrane installation, the CQA Consultant shall indicate to the Installer and COUNTY locations which may not provide adequate support to the geomembrane so the areas in question can be tested and, if necessary, repaired.

Special care shall be taken to avoid desiccation cracking of an underlying soil liner in a composite liner system. To that end the soil surface shall be observed by the Installer and the CQA Consultant and the decision to repair cracks, if any, shall be made by the COUNTY and the ENGINEER.

6.1.5 Anchor Trenches

The CQA Consultant shall verify that the anchor trench has been constructed according to design Drawings and Specifications.

Rounded or smoothed corners shall be provided where the geomembrane enters the trench so as to avoid sharp bends in the geomembrane. No loose or excessively wet soil shall be allowed to underlie the geomembrane in the anchor trench.

The anchor trench shall be adequately drained to prevent ponding or otherwise softening of the adjacent soils while the trench is open. The anchor trench shall be carefully backfilled and compacted by the Contractor or the Installer, as outlined in the Specifications. Care shall be taken when backfilling the trenches to prevent bridging of the geomembrane or damage.

6.1.6 Field Panel Identification

The CQA Consultant shall verify that each field panel is given a unique identification code (number or letter-numbered) consistent with the layout plan. This identification code shall be agreed upon by the Installer and CQA Consultant. The CQA Consultant and Installer shall establish a table or chart showing correspondence between roll numbers and field panel identification codes. The field panel identification code shall be used for all quality assurance documentation.

The CQA Consultant shall verify that field panels are installed at the location indicated in the Installer's layout plan, as approved or modified, and that the Installer has marked the identification code and roll number on each installed panel. The Installer and CQA Consultant shall also verify that the condition of the supporting soil has not changed detrimentally during installation. The CQA Consultant shall record the identification code, location, and date of installation of each field panel.

6.1.7 Field Panel Placement and Deployment

Geomembrane panel placement shall not be done during any precipitation, in the presence of excessive moisture (e.g., fog, dew), in areas of ponded water, or in the presence of strong winds. Manufacturer's recommendations or the Specifications should be followed, whichever is more stringent, for extreme ambient temperature conditions.

Panels shall be oriented according to the Installer's panel layout drawing as approved by the CQA Consultant and COUNTY. Seams shall be located outside of areas of potential high stress conditions, at slope intersections and corners, or other areas considered critical. Horizontal seams on slopes steeper than 10 (horizontal) to one (vertical) shall be avoided. The CQA Consultant shall review the seam orientations prior to seaming operations to determine if these conditions are satisfied.

The CQA Consultant shall verify that the geomembrane handling equipment used does not pose risk of damage to the geomembrane or subgrade, and that the Installer's personnel take care in handling the geomembrane at all times.

Contact between the soil liner and the geomembrane shall be maintained in all areas. The Installer shall take into account ambient temperature and its effect on the thermal expansion and contraction of the geomembrane. The geomembrane materials shall be deployed in a manner which minimize wrinkling. Partial backfilling of anchor trenches, adequate loading of the toe of slope during lower ambient temperatures is recommended to prevent displacement by bridging.

The CQA Consultant shall also verify and notify the COUNTY that:

- Equipment used does not damage the geomembrane during trafficking, handling, excessive heat or other means.

- The method of deploying the geomembrane does not cause excessive scratches or crimps in the geomembrane, and does not damage the approved subgrade surface.

- Personnel working on the geomembrane do not smoke or wear damaging shoes.

- The geomembrane is protected by appropriate means in areas of excessive traffic.

- Adequate ballast (e.g., sand bags) has been placed to prevent wind uplift and is not likely to damage the geomembrane. Continuous loading is recommended along edges of panels in high winds, or when work is terminated for several days or longer periods.

The CQA Consultant shall visually inspect each panel for defects or damage after placement and prior to seaming. Damaged panels or portions of damaged panels shall be marked and repaired, or removed from the work area. Repairs shall be made according to procedures described in the Specifications.

6.1.8 <u>Field Seaming</u>

6.1.8.1 Personnel Requirement--

The Installer shall be prequalified in accordance with the Specifications and approved by the COUNTY.

The Installer's Superintendent shall be qualified based on previously demonstrated experience, management ability, and authority. The Superintendent is responsible for the Installer's field crew and will represent the Installer at all project meetings.

6.1.8.2 Seam Layout--

Prior to the installation of geomembrane, the Installer shall provide the COUNTY and CQA Consultant with a panel layout drawing showing all expected major panel seams. The COUNTY or ENGINEER shall approve in writing the panel layout drawing.

6.1.8.3 Seaming Methods--

Accepted seaming methods consist of those recommended by the Manufacturer of the geomembrane product, and which will result in seams that meet testing requirements as indicated in the Specifications for both destructive and non-destructive samples.

For polyethylene geomembranes, the accepted methods include extrusion and fusion-welding.

Proposed alternate methods shall be documented by the Installer and CQA Consultant. The CQA Consultant shall review all documentation regarding alternative seaming methods to be used. The COUNTY or Engineer shall approve in writing any alternative seaming methods.

Fusion-welding apparatus shall be an automated, roller-mounted device. The fusion-welding apparatus shall be equipped with gauges indicating the applicable temperatures and pressures. The CQA Consultant shall log ambient, seaming apparatus, and geomembrane surface temperatures as well as seaming apparatus pressures.

Extrusion-welding apparatus shall be equipped with gauges indicating the temperature in the apparatus and at the nozzle.
The Installer shall provide documentation regarding the extrudate to the CQA Consultant, and shall certify that the extrudate is compatible with the Specifications and is comprised of the same resin as the geomembrane sheeting.

The CQA Consultant shall log apparatus temperatures, extrudate temperatures, ambient temperatures, and geomembrane surface temperatures at appropriate intervals.

6.1.8.4 Seam Preparation--

The CQA Consultant shall verify that:

- Seams are aligned with the fewest possible number of wrinkles and "fishmouths".
- Prior to seaming, the seam area is clean and free of moisture, dust, dirt, debris of any kind, and foreign material.
- If seam overlap grinding is required, the process is completed according to the Manufacturer's instructions within one hour of the seaming operation, and does not damage the geomembrane.

- For cross seams, the edge of the cross seam is ground to a smooth incline (top and bottom) prior to welding.

- A smooth insulating plate or fabric is placed beneath the hot welding apparatus after usage.

- The geomembrane is protected from damage in heavily trafficked areas.

- A movable protective layer (i.e., plywood, geomembrane) may be used as necessary directly below each overlap of geomembrane that is to be seamed to prevent buildup of moisture between the sheets.

- The panels of geomembrane have a finished overlap of 4 inches for extrusion welding and 6 inches for fusion welding, but in any event sufficient overlap shall be provided to allow peel tests to be performed on the seam.

- The procedure used to temporarily bond adjacent panels together does not damage the geomembrane.

6.1.8.5 Weather Conditions for Seaming--

The Installer and CQA Consultant shall observe weather conditions during seaming operations to determine if excessive temperatures, moisture or humidity, or winds exist that could impact the welding process. Manufacturer's recommendations shall be followed for seaming under extreme weather conditions, unless otherwise approved by the COUNTY and CQA Consultant based on the Installer's experience and recommendations.

As indicated in the Specifications, welding shall not occur when ambient air temperatures measured one-foot above the geomembrane are below 32-degrees F or above 104-degrees F and as noted in the Specifications. Preheating of the seams may be used if trial seams have been performed using the same preheating method(s) and meet all criteria for acceptance. Wind conditions shall also be considered in determination of acceptable ambient conditions.

6.1.8.6 General Seaming Procedures--

During seaming, the CQA Consultant shall verify the following conditions:

- Seaming shall extend to the outside edge of panels placed within the anchor trench.

- A firm substrate shall be provided using a flat board or similar hard surface directly under the seam overlap to achieve proper support, if necessary.

- "Fishmouths" or wrinkles at the seam overlap shall be cut along the ridge in order to achieve a flat overlap. The cut "fishmouth" or wrinkle shall be seamed and any portion where the overlap is inadequate shall be patched with an oval or round geomembrane patch that extends a minimum of 6 inches beyond the cut in all directions.

- Adequate lighting shall be provided if seaming operations are performed at night or during periods of diminished natural light.

- Startup testing is conducted and recorded prior to initiating welding.

6.1.9 <u>Seam Testing</u>

6.1.9.1 Nondestructive Testing of Field Seams--

The Installer shall nondestructively test all field seams over their full length using a vacuum test unit, air pressure test (double fusion seams only), or other approved method. The purpose of this testing is to determine the continuity of the seams only. Nondestructive testing shall be performed as work progresses, not at completion.

The CQA Consultant shall observe nondestructive testing procedures and inform the Installer and COUNTY of required repairs. The CQA Consultant shall record the location, date, name, and outcome of all testing.

The Installer shall complete required repairs in accordance with the Specifications. The CQA Consultant shall observe the repair and testing of the repair, document the repair and test results, and mark on the geomembrane that the repair has been completed. All repairs shall be shown on the record Drawings, or if this is not practical, noted in repair logs and on daily reports.

Vacuum testing equipment and methods are discussed in the Specifications.

Air pressure testing procedures are applicable to fusion-welding that produces a double seam with an enclosed air channel. The equipment and methods are discussed in the Specifications.

6.1.9.2 Destructive Testing--

Destructive seam tests shall be performed on seam samples cut from the geomembrane locations selected by the CQA Consultant. The purpose of these tests is to evaluate seam strength. Seam strength testing shall be done as the seaming work progresses, not at the completion of all field seaming.

The CQA Consultant shall select locations where seam samples will be cut by the installer for laboratory testing. Those locations shall be established as follows:

- A minimum average frequency of one test location per 500 feet of seam length or one test location per seam, whichever is greater.

- At least one location for each seaming machine each day.

- At locations where the CQA Consultant suspects that inadequate seaming methods or conditions occurred or other factors causing to reduce seam strength exist.

The Installer shall not be informed in advance of the locations where the destructive seam samples will be taken.

6.1.9.3 Sampling Procedures--

Samples shall be cut by the Installer at locations selected by the CQA Consultant as the seaming progresses, such that laboratory test results are available before the geomembrane is covered by another material.

The CQA Consultant shall observe the sample cutting, assign a number to each sample, and mark it accordingly, and record the sample location on the layout drawing.

All holes in the geomembrane resulting from destructive seam sampling shall be immediately repaired in accordance with specified repair procedures. The continuity of the new seams in the repaired area shall be non-destructively tested according to procedures described herein.

The sample for laboratory testing shall be 12 inches wide across the seam by 42 inches long with the seam centered lengthwise. The sample shall be cut into three segments and distributed as follows:

- 12 inches x 14 inches to the Installer for laboratory testing.

- 12 inches x 14 inches to the CQA Geosynthetics Laboratory for testing.

- 12 inches x 14 inches to the COUNTY for archive storage.

The CQA Consultant is responsible for packaging and shipping samples to the CQA Geosynthetics Laboratory in a manner that will not damage the samples.

6.1.9.4 CQA Geosynthetics Laboratory--

Testing shall include ASTM D-6392 "Practice for Determining the Integrity of Field Seams Used in Joining Polymer Sheet Membranes". The minimum acceptable values to be obtained in these tests are those indicated in the Specifications. At least five specimens shall be tested for each test method. Specimens shall be selected from the samples and tested alternately (i.e., peel, shear, peel, shear, etc.). For double wedge welds, both inner and outer seams shall be tested and determined to be acceptable.

The CQA Geosynthetics Laboratory shall provide verbal test results no more than 24 hours after they receive the samples. The CQA Consultant shall review laboratory test results as soon as they become available, and make appropriate recommendations to the Installer.

6.1.9.5 Procedures for Destructive Test Failures--

All acceptable seams must be bounded by two locations from which samples passing laboratory destructive tests have been taken. In cases exceeding 150 feet (50 m) of reconstructed seam, a sample taken from the zone in which the seam has been reconstructed must pass destructive testing.

The procedures outlined in the Specifications shall apply whenever a sample fails a destructive test, whether that test is conducted by the CQA Consultant, the Installer, the Contractors independent CQC laboratory, or by field tensiometer.

The CQA Consultant shall document all actions taken in conjunction with destructive test failures.

6.1.10 Defects, Repairs and Wrinkles

The entire geomembrane, including seams, shall be visually examined by the CQA Consultant for identification of visual defects, holes, blisters, undispersed raw materials and signs of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of examination. The geomembrane surface shall be swept or washed by the Installer if dust, mud or other matter inhibits examination. All areas having defects and/or requiring repairs shall be repaired.

Work shall not proceed with any materials which will cover locations which have been repaired until the CQA Consultant has re-examined the repaired area and applicable laboratory test results with passing values are available.

Panels or portions of panels which are, in the opinion of the CQA Consultant, damaged beyond repair shall be removed from the site and replaced. Damage, which in the CQA Consultant's opinion, can be repaired may be repaired or replaced.

Any portion of the geomembrane exhibiting a flaw or failing a destructive or nondestructive test shall be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be agreed upon between the CQA Representative, Installer, and ENGINEER.

Each repair shall be numbered and logged. Each repair shall be non-destructively tested using the methods described in the Specifications as appropriate. Repairs which pass the non-destructive test shall be taken as an indication of an adequate repair. Large caps may be of sufficient extent to require destructive test sampling, at the discretion of the CQA Consultant. In the case of failed tests, the repair shall be redone and retested until a passing test results. The

CQA Consultant shall observe all repairs and all non-destructive testing of repairs, note on the membrane that it has been repaired, and document each repair thoroughly.

When seaming of the geomembrane is completed (or when seaming of a large area of the geomembrane is completed) and prior to placing overlying materials, the CQA Consultant shall indicate which wrinkles should be cut and re-seamed by the Installer. Wrinkle size shall be evaluated during the time of day and under conditions similar to those expected when overlying protective cover/drainage layer material is to be placed. All wrinkles higher than they are wide (across their base) or more than 6 inches high shall be removed by repair methods and retested.

6.2 GEOTEXTILES

This quality assurance testing program has been established to verify that specified geotextiles are manufactured, installed and tested according to project Specifications.

6.2.1 Manufacturer Quality Control Documentation

The Geotextile Manufacturer shall provide the CQA Consultant with the following information prior to the installation of the geotextile:

- A list of materials which comprise the geotextile and a Specification for the geotextile which includes all properties contained in the project Specifications measured using the appropriate test methods.

- Written certification that the minimum average roll values given in the Specification are guaranteed by the Manufacturer.

- Written certification that the Manufacturer has continuously inspected the geotextile for the presence of needles and found the geotextile to be needle free.

- Quality control certifications, which shall include roll identification numbers, sampling procedures, and quality control test results signed by a responsible party employed by the Manufacturer. At a minimum, results shall be given for:

  1. Mass per unit area, oz/yd^2 (ASTM D 5261)
  2. Apparent Opening Size, US sieve (ASTM D 4751)
  3. Flow Rate, gpm/ft^2 (ASTM D 4491)
  4. Puncture Strength, lb (ASTM D 4833)
  5. Trapezoidal Tear Strength, lb (ASTM D 4533)
  6. Grab Tensile, lb (ASTM D 4632)

  Results of quality control tests conducted by the Manufacturer to verify the geotextile meets the project Specifications.

Quality control tests shall be performed in accordance with test methods and frequencies required by the project Specifications.

All rolls of geotextile shall be identified by the Manufacturer with the following:

- Manufacturer's Name.
- Roll Number.
- Product Identification.
- Roll Dimensions.

The CQA Consultant shall review these documents to verify that:

- Property values certified by the Manufacturer meet all Specifications listed in the Specifications.

- The Manufacturer's measurements of properties are properly documented and test methods used acceptable.

- Rolls are properly labeled.

- Project Specifications shall be met with the certified minimum average roll properties.

- Quality control certificates have been provided at the specified frequency for all rolls.

Any discrepancies shall be reported to the COUNTY and Manufacturer.

6.2.2 Conformance Sampling and Testing

The CQA Consultant shall verify that conformance test samples are obtained for the geotextile upon delivery to the site. At a minimum, geotextile conformance tests performed are as follows:

- Mass per unit area, oz/yd^2 (ASTM D 5261)
- Apparent Opening Size, US sieve (ASTM D 4751)
- Flow Rate, gpm/ft^2 (ASTM D 4491)
- Puncture Strength, lb (ASTM D 4833)

The CQA Consultant shall select the rolls to be tested. Samples shall be three feet long by the width of the roll, and shall not include the first complete revolution of the roll. Samples shall not include any portion of a roll which has been subjected to excess pressure or stretching. All lots of material and the particular test sample that represents each lot shall be defined before the samples are taken.

Samples shall be taken at a rate of one per lot, but not less than one conformance test per 100,000 square feet of geotextile or portion thereof.

The CQA Consultant shall review all conformance test results and accept or reject the roll prior to deployment. All nonconforming test results shall be reported to the COUNTY and Installer. The CQA Consultant is responsible for reviewing test results to verify that the property values meet or exceed values listed in the project Specifications.

If any failing test results may be the result of the CQA Geosynthetics Laboratory incorrectly conducting the test, the Manufacturer may request a retest to be conducted at the CQA Geosynthetics Laboratory in the presence of a representative of the Manufacturer.

All material from a lot represented by a failing test should be rejected or additional conformance test samples may be taken to isolate the portion of the lot not meeting Specifications. (This procedure is only valid when rolls in a lot are consecutively produced and numbered from one manufacturing line). Additional samples shall be taken from rolls either side of the failing roll, until passing test results are achieved, to establish the range of failure within the lot. All rolls lying within this range of failure shall be rejected.

6.2.3 Geotextile Storage, Handling and Placement

Geotextile shall be protected from ultraviolet light exposure, precipitation, mud, puncture, cutting, or other deleterious conditions during shipment, handling and storage. Geotextile rolls shall be shipped and stored in relatively opaque and watertight wrapping which shall be removed shortly before deployment.

The Installer shall handle all geotextile in such a manner as to minimize damage, and the following shall be complied with:

- All deployed geotextile shall be stabilized with sandbags or the equivalent ballast in the presence of wind. Such sandbags shall remain until replaced with cover material.

- The entire surface of the geotextile shall be visually inspected to ensure that no potentially harmful foreign objects are present.

- On slopes, the geotextiles shall be securely anchored in the anchor trench and rolled down the slope in such a manner as to continually keep the geotextile sheet in tension.

- Geotextiles shall be cut using an approved geotextile cutter only. If in place, special care must be taken to protect other materials from damage which could be caused by the cutting of the geotextiles.

- The Installer shall take any necessary precautions to prevent damage to underlying layers during placement of the geotextile.

- Care shall be taken not to entrap stones, excessive dust, or moisture within the geotextile that could damage the geomembrane, result in clogging of drains or filters, or hamper subsequent seaming.

- After installation, a visual examination of the geotextile shall be carried out over the entire surface, to verify that no potentially harmful foreign objects, such as needles or staples, are present.

6.2.4 Seaming Procedures

Geotextile shall be overlapped in accordance with the requirements of the Specifications. On slopes steeper than 10 feet horizontal to 1 foot vertical (10H:1V), all geotextiles shall be continuously sewn. In general, no horizontal seams shall be allowed on side slopes, except as part of a patch.

Sewing shall be done using polymeric thread with chemical or ultraviolet light resistant properties equal to or greater than those of the geotextile.

6.2.5 Defects and Repairs

Holes or tears in the geotextile shall be repaired with a patch of the same geotextile double-sewn or heat-tacked into place. Repairs occurring on slopes steeper than 10H:1V shall be double-sewn in place. Should any tear exceed ten percent of the width of the roll, that roll shall be removed and replaced. Soil or other material which may have penetrated the torn geotextile shall be removed.

The CQA Consultant shall observe any repairs and report any noncompliance to the COUNTY.

6.2.6 Placement of Soil Materials

The Contractor or Installer shall place all soil materials on top of a geotextile in such a manner as to minimize:

- Damage to the geotextile.
- Slippage of the geotextile on underlying layers.
- Excess tensile stresses in the geotextile.

Any noncompliance shall be noted by the CQA Consultant and reported to the Installer and COUNTY.

6.3 GEOCOMPOSITES

6.3.1 Manufacturer Quality Control Documentation

The Manufacturer shall provide the CQA Consultant with the following information prior to the installation of the geocomposite:

- A list of materials which comprise the geotextile and geotextile and a Specification for the each which includes all properties contained in the project Specifications, measured using the appropriate test methods.

- A specification for the fused geotextile and geonet (geocomposite) which includes all properties contained in the project Specifications, measured using the appropriate test methods.

- Written certification that the minimum average roll values given in the Specification are guaranteed by the Manufacturer.

- Written certification that the Manufacturer has continuously inspected the geotextile for the presence of needles and found the geotextile to be needle free.

- Quality control test results performed in accordance with test methods and frequencies required by the project Specifications.

- Quality control certifications, which shall include roll identification numbers, sampling procedures, and quality control test results for the geotextile, geonet, and geocomposite signed by a responsible party employed by the Manufacturer.

6.3.2 Manufacturer Test Results

Results of quality control tests conducted by the Manufacturer to verify the geocomposite meets the project Specifications. At a minimum, the following results shall be given.

6.3.2.1 HDPE Resin--

1. Polymer Density (ASTM D 1505)
2. Polymer Melt Index (ASTM D 1238)

6.3.2.2 Geonet--

1. Density (ASTM 1505)
2. Thickness (ASTM D 1777)
3. Mass per Unit Area (ASTM D 3776)

6.3.2.3 Geotextile--

1. Mass per unit area (ASTM D 3776)
2. Apparent Opening Size, US sieve (ASTM D 4751)
3. Puncture Resistance, lb (ASTM D 4833)
4. Trapezoidal Tear Strength, lb (ASTM D 4533)
5. Grab Tensile, lb (ASTM D 4632)

6.3.2.4 Geocomposite--

1. Ply Adhesion (GRI GC7)
2. Transmissivity (ASTM D4716)

All rolls of geocomposite shall be identified by the Manufacturer with the following:

- Manufacturer's Name
- Roll Number
- Product Identification
- Roll Dimensions

The CQA Consultant shall review these documents to verify that:

- Property values certified by the Manufacturer meet all Specifications listed in the Specifications.
- The Manufacturer's measurements of properties are properly documented and test methods used acceptable.
- Rolls are properly labeled.
- Project Specifications shall be met with the certified minimum average roll properties.
- Quality control certificates have been provided at the specified frequency for all rolls.

Any discrepancies shall be reported to the COUNTY and Manufacturer.

6.3.3 Conformance Sampling and Testing

The CQA Consultant shall verify that conformance test samples are obtained for the geotextile upon delivery to the site. At a minimum, conformance tests performed are as follows:

6.3.3.1 Geonet--

1. Density (ASTM 1505)
2. Thickness (ASTM D 1777)
3. Mass per Unit Area (ASTM D 3776)

6.3.3.2 Geotextile--

1. Mass per unit area (ASTM D 3776)
2. Apparent Opening Size, US sieve (ASTM D 4751)
3. Puncture Resistance, lb (ASTM D 4833)

6.3.3.3 Geocomposite--

1. Ply Adhesion (GRI GC7)
2. Transmissivity (ASTM D 4716)

The CQA Consultant shall select the rolls to be tested. Samples shall be three feet long by the width of the roll, and shall not include the first complete revolution of the roll. Samples shall not include any portion of a roll which has been subjected to excess pressure or stretching. All lots of material and the particular test sample that represents each lot shall be defined before the samples are taken.

Samples shall be taken at a rate of one per lot, but not less than one conformance test per 100,000 square feet of geocomposite or portion thereof.

The CQA Consultant shall review all conformance test results and accept or reject the roll prior to deployment. All nonconforming test results shall be reported to the COUNTY and Installer. The CQA Consultant is responsible for reviewing test results to verify that the property values meet or exceed values listed in the project Specifications.

If any failing test results may be the result of the CQA Geosynthetics Laboratory incorrectly conducting the test, the Manufacturer may request a retest to be conducted at the CQA Geosynthetics Laboratory in the presence of a representative of the Manufacturer.

All material from a lot represented by a failing test should be rejected or additional conformance test samples may be taken to isolate the portion of the lot not meeting Specifications. (This procedure is only valid when rolls in a lot are consecutively produced and numbered from one manufacturing line). Additional samples shall be taken from rolls either side of the failing roll, until passing test results are achieved, to establish the range of failure within the lot. All rolls lying within this range of failure shall be rejected.

6.3.4 Geocomposite Storage, Handling and Placement

Geocomposite shall be protected from ultraviolet light exposure, precipitation, mud, puncture, cutting, or other deleterious conditions during shipment, handling and storage. Geocomposite rolls shall be shipped and stored in relatively opaque and watertight wrapping which shall be removed shortly before deployment.

The Installer shall handle all geocomposite rolls in such a manner as to minimize damage, and the following shall be complied with:

- All deployed geocomposite shall be stabilized with sandbags or an equivalent ballast in the presence of wind. Such sandbags shall remain until replaced with cover material.

- The entire surface of the geocomposite shall be visually inspected to ensure that no potentially harmful foreign objects are present.

- On slopes, the geocomposites shall be securely anchored in the anchor trench and rolled down the slope in such a manner as to continually keep the sheet in tension.

- Geocomposites shall be cut using an approved cutter only. If in place, special care must be taken to protect other materials from damage which could be caused by the cutting of the geocomposite.

- The Installer shall take any necessary precautions to prevent damage to underlying layers during placement of the geocomposite.

- Care shall be taken not to entrap stones, excessive dust, or moisture within the geocomposite that could damage the geomembrane, result in clogging of drains or filters, or hamper subsequent seaming.

- After installation, a visual examination of the geocomposite shall be carried out over the entire surface, to verify that no potentially harmful foreign objects, such as needles or staples, are present.

6.3.5 Seaming Procedures

The end of each roll of geocomposite shall be overlapped a minimum of six inches. The geonet portion shall be shingled, with the uphill end overlapping the downhill end and tied 2 feet on center at a minimum. The bottom layer of geotextile shall be overlapped a minimum of 6 inches. The upper layer of geotextile shall be machine sewn. Sewing shall be done using polymeric thread with chemical or ultraviolet light resistant properties equal to or greater than those of the geotextile. Where the geocomposite is to terminate, the upper geotextile shall be folded over the ends with a minimum of 12 inches of geotextile placed under the geocomposite.

At roll sides, the material shall be overlapped a minimum of 4 inches. The bottom geotextile shall be overlapped. The geonet shall be overlapped and tied a minimum of 5 feet on center with nylon ties as described above. The upper layer of geotextile shall be machine sewn as described above.

6.3.6 Defects and Repairs

Generally, damaged, soiled, or delaminated products shall be discarded. Holes or tears 2 inches or smaller in diameter may be repaired by snipping our protruding geonet and machine sewing or thermal bonding a geotextile patch over the hole. The patch shall be a minimum of 12 inches larger than the damaged area in all directions. If thermal bonding is conducted, care shall be takes to prevent excessive heat damage to the surrounding geosynthetics.

Panels with holes or tears greater than 2 inches in diameter through the product shall be repaired by replacing the entire panel width. The CQA Consultant shall observe any repairs and report any noncompliance to the COUNTY.

6.3.7 Placement of Soil Materials

The Contractor or Installer shall place all soil materials on top of a geotextile in such a manner as to minimize:

- Damage to the geocomposite.
- Slippage of the geocomposite on underlying layers.
- Excess wrinkles and tensile stresses in the geocomposite.

Any noncompliance shall be noted by the CQA Consultant and reported to the Installer and COUNTY.

FLORIDA DEPARTMENT OF
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SECTION 7

DOCUMENTATION

An effective CQA Program depends largely on recognition of all construction activities that shall be monitored, and on assigning responsibilities for the monitoring of each activity. This is most effectively accomplished and verified by the documentation of quality assurance activities. The CQA Consultant shall document that quality assurance requirements have been addressed and satisfied.

The CQA Consultant shall maintain at the site a complete file of design plans, project Specifications, test procedures, daily logs, and other pertinent documents.

7.1 REPORTS

Standard reporting procedures shall include preparation of a daily report which, at a minimum, shall consist of:

- A daily summary report including memoranda of meetings and discussions with the COUNTY and/or site Contractors.
- Observation logs detailing construction activities for the day, and test results, as appropriate.

Other forms of daily record keeping to be used as appropriate include construction problem and solution data sheets and photographic reporting data sheets. This information shall be regularly submitted to and reviewed by the COUNTY.

7.1.1 Daily Logs and Summary Reports

The CQA Consultant shall prepare daily logs and summary reports which shall include the following information:

- An identifying report number for cross-referencing and document control.
- Date, project name, location, and other identification.
- Data on weather conditions.
- Information on meetings held or discussions which took place including:

  1. Names of parties to discussion.
  2. Relevant subject matter or issues.
  3. Decisions reached.

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4. Activities and their schedule.

- A reduced-scale site plan or sketch showing work areas and test locations.
- Descriptions and locations of ongoing construction.
- Descriptions and specific locations of areas, or units, of work being tested and/or observed and documented.
- • Locations where tests and samples were taken or reference to specific observation logs and/or test data sheets where such information can be found.
- A summary of field/laboratory test results or reference to specific observation logs and/or test data sheets.
- Calibrations of test equipment.
- Off-site materials received, including quality verification documentation.
- Decisions made regarding acceptance of units of work, and/or corrective actions to be taken in instances of substandard quality.
- The CQA Consultant's signature.
- Photographs of representative activities

7.1.2 Observation and Testing Reports

The CQA Consultant shall record observations of construction and CQA-related activities on project specific observation and testing reports. At a minimum, the observation and testing reports shall include the following information:

- An identifying sheet numbered for cross referencing and document control.
- Date, project name, location, and other identification.
- Description or title of activity monitored.
- Location of activity and locations of samples collected.
- Locations of field tests performed and their results.
- Results of laboratory tests received.
- Results of monitoring activity in comparison to Specifications.
- The CQA Consultant's signature.

Reports describing problem identification, corrective measures reports or special construction situations shall be prepared by the CQA Consultant and cross-referenced to specific observation and testing reports. These reports shall include the following information:

- An identifying sheet number for cross-referencing and document control.

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- A detailed description of the situation or deficiency.
- The location and probable cause of the situation or deficiency.
- How and when the situation or deficiency was found or located.
- Documentation of the response to the situation or deficiency.
- Final results of any responses.
- Any measures taken to prevent a similar situation from occurring in the future.
- The signature of the CQA Consultant and the signature of the COUNTY or ENGINEER indicating concurrence.

The COUNTY shall be made aware of any ~~significant recurring~~ nonconformance with the project Specifications. The COUNTY shall then determine the cause of the nonconformance and recommend appropriate changes in procedures or Specifications. These changes will be submitted to the Design Engineer for approval. When this type of evaluation is made, the results shall be documented, and any revision to procedures or project Specifications will be approved by the COUNTY, Design Engineer, and, if necessary, the Permitting Agency.

7.2 PHOTODOCUMENTATION AND REPORTING DATA SHEETS

Photodocumentation and reporting data sheets shall be cross-referenced with observation and test reports and/or problem identification and corrective measure reports.

These photographs will serve as a pictorial record of work progress, problems, and mitigation activities. The basic file shall contain color prints; negatives shall be stored in a separate file in chronological order. These records will be presented to the COUNTY upon completion of the project.

In support of photographic documentation, videotaping may be used to record work progress, problems, and mitigation activities.

7.3 DESIGN AND/OR SPECIFICATION CHANGES

Design and/or project Specification changes may be required during construction. In such cases, the CQA Consultant shall notify the COUNTY and the Design Engineer. The COUNTY shall then notify the Permitting Agency if necessary.

Design and/or project Specification changes shall be made only with the written agreement of the COUNTY and the Design Engineer, and shall take the form of an Addendum to the project Specifications.

7.4 PROGRESS REPORTS

The CQA Consultant shall prepare a progress report at time intervals established at the Pre-construction meeting and submit to the COUNTY. At a minimum, this report shall include the following information:

- An identifying sheet numbered for cross referencing and document control.
- Date, project name, location, and other identification.
- A summary of work activities during the progress reporting period.
- A summary of construction situations, deficiencies, and/or defects occurring during the progress reporting period.
- A summary of test results, failures, and retests.
- The signature of the CQA Consultant.

The COUNTY shall distribute copies of the Progress Reports to the Permitting Agency and, upon request, Geosynthetics Installer and Contractor or as decided at the Pre-construction Meeting.

7.5 AS-BUILT DRAWINGS

As-Built Drawings shall include, but are not limited to the following:

- Scale plans depicting the location of construction.
- Details pertaining to the extent of construction (e.g., depths, plan dimensions, elevations, soil component thicknesses, over excavation, etc.).
- Base maps required for the development of the record plans shall be done by a qualified land surveyor.
- Each layer of geomembrane identifying panels with appropriate numbers, destructive seam samples locations, patches, and repairs locations.
- Pertinent details.
- Changes from the construction Drawings.

7.6 FINAL DOCUMENTATION REPORT AND CERTIFICATION

At the completion of the work, the CQA Consultant shall submit to the COUNTY the signed Final Documentation Report. At a minimum, the Final Documentation Report shall include:

- Summaries of all construction activities.
- Observation logs and test data sheets including sample location plans and supporting field and laboratory test results.
- Construction problems and solutions reports.
- Changes from design and material specifications.
- As-Built Drawings.
- If required by the regulatory agency, a summary statement sealed and signed by a professional engineer registered in the state that the construction has been completed in <u>substantial conformance</u> with project Specifications and design plans.

ATTACHMENT H-3

ANCHOR TRENCH CALCULATIONS

File No. 09199033.09

SUBJECT: Anchor Trench and Runout Requirements, Hardee County Landfill Expansion
Hardee County, Florida

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SCS ENGINEERS

SHEET 1 OF 6

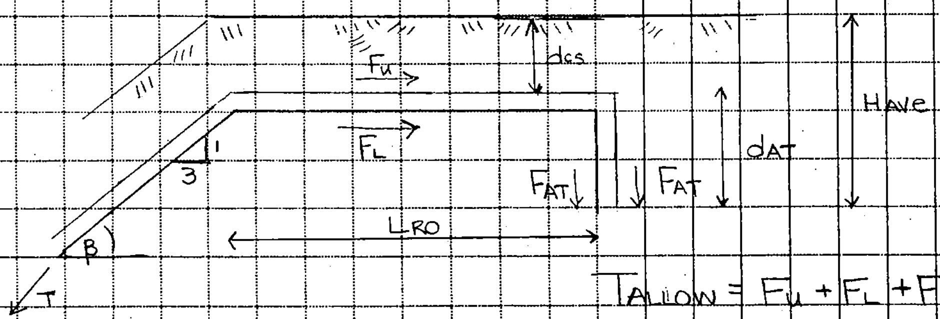
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT		BY LEK	DATE 9/22/03
Anchor Trench & Runout Requirements		CHECKED JHD	DATE

Objective: Determine the depth of anchor trench and length of runout to secure HDPE liner

Given:

1. Smooth 60-mil HDPE geomembrane over sandy soil
2. Side slopes at 3(H):1(V)
3. Geomembrane will pull out of trench prior to failure

Approach: Design equations by Koerner based on the force diagram shown below.



$T_{ALLOW} = F_U + F_L + F_{AT}$

where T_{allow} = $\sigma_{allow}\, t$, in which
σ_{allow} = the mobilized allowable geomembrane stress = σ_{ult}/FS,
σ_{ult} = the ultimate geomembrane stress (e.g., yield or break),
FS = the factor of safety, and
t = the geomembrane thickness,
F_U = the friction force above geomembrane (assumed to be negligible, since the cover soil probably moves along with the liner as it deforms),
F_L = $q \tan \delta\, (L_{RO})$, in which
q = the surcharge pressure = $d_{CS}\, \gamma_{CS}$,
d_{CS} = the depth of cover soil,
γ_{CS} = the unit weight of cover soil,
δ = the friction angle between geomembrane and soil, and
L_{RO} = (unknown) length of runout, and
F_{AT} = $(\sigma_h)_{ave} \tan \delta\, (d_{AT})$, in which
σ_h = the average horizontal stress in anchor trench = $K_O\, \sigma_V$,
σ_V = $\gamma\, H_{ave}$,
γ = the unit weight of backfill soil,
H_{ave} = the average depth of anchor trench (requires an estimate),
K_O = $1 - \sin \phi$,
ϕ = the angle of shearing resistance of backfill soil, and
d_{AT} = the (unknown) depth of anchor trench.

CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT		BY LEK	DATE 9/22/03
Anchor Trench & Runout Requirements		CHECKED	DATE

Reference: Designing with Geosynthetics, 3rd Edition, Robert Koerner

Solution:

a. According to the Geosynthetic Research Institute, GRI Standard GM13, a textured 60-mil liner should have at least a tensile strength at yield of 126 lb/in-width (Sheet

The cross-sectional area = 1" wide × 0.060" thick (60-mils)

$\sigma_{ult} = \frac{126\ lb}{0.06\ in^2} = 2100\ psi$

A large factor of safety is not required because we are designing the liner system to pull out at the yield strength → FS = 1.0

$\sigma_{allow} = \sigma_{ult} = 2100\ psi$

b. $T_{allow} = \sigma_{allow} t = 2100\ psi \times 0.06\ in \times \frac{12\ in}{ft} = 1512\ lb/ft$ (Eq'n 5.25)

$T_{allow} = 1512\ lb/ft$

c. $F_U = 0$ The soil cover is assumed to move with the geomembrane

d. $F_L = q(\tan\delta)L_{RO}$

$q = d_{cs}\gamma_{cs}$

Assume d_{cs} (depth cover soil) = 1 ft

Assume $\gamma_{cs} = 105\ lb/cf$

$q = 105\ \frac{lb}{cf} \times 1\ ft = 105\ \frac{lb}{sf}$

Choose $\delta = 18°$ geomembrane-to-soil interface

Koerner, Table 5.7 (Sheet

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Anchor Trench & Runout Requirements	LEK	9/22/03
	CHECKED: JH	DATE

$F_L = 105 \frac{lb}{ft^2} \times L_{RO} \times \tan 18° = 34.2 L_{RO}$

$F_L = 34.2 L_{RO}$

e. $2F_{AT} = 2 K_o \sigma_{v_{Ave}} \tan\delta (d_{AT})$

Where $K_o = 1 - \sin\phi$ (ϕ = angle of shearing resistance of soil)
$\sigma_{v_{Ave}} = \gamma H_{Ave}$ (H_{Ave} = avg. depth of anchor trench)
$\delta = 18°$
d_{AT} = unknown depth of anchor trench

Assume $\phi = 30°$ (concrete sand, see Sheet
Assume $H_{Ave} = f d_{AT} = d_{AT} + d_{cs}$

$2F_{AT} = 2 \times (1 - \sin 30°) \times 105 \frac{lb}{cf} \times (d_{AT} + 1\ ft) \times \tan 18° \times d_{AT}$

$2F_{AT} = 34.2 d_{AT} (d_{AT} + 1)$

f. Find depth of trench and length or runout:

$T_{allow} = F_u + F_L + 2F_{AT}$

$1512 \frac{lb}{ft} = 0 + 34.2 L_{RO} + 34.2 d_{AT} (d_{AT} + 1)$

b/c 2 unknowns, use trial and error:

1. If $d_{AT} = 1 ft$ $\quad L_{RO} = \dfrac{1512 \frac{lb}{ft} - 34.2 \frac{lb}{cf} \times 1 ft (1 ft + 1 ft)}{34.2 \frac{lb}{cf}} = 42 ft$
$L_{RO} = 42 ft$

2. If $d_{AT} = 2 ft$ $\quad L_{RO} = \dfrac{1512 - 34.2 \times 2 \times 3}{34.2} = 38 ft$
$L_{RO} = 38 ft$

SCS ENGINEERS

CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 04199033.09	
SUBJECT		BY LEK	DATE 9/22/03
Anchor Trench & Runout Requirements		CHECKED JHO	DATE

Conclusion:

- As shown of Sheet 3, to cause the geomembrane to yield while held in place by the anchor trench, a 38 - 42 ft runout is needed.

- The length of 38 - 42 ft is greater than what will be designed.

- For any LRO and CAT lower than those shown on Sheet 3, the geomembrane will pull out of the overburden before it reaches the yield point of HDPE.

GRI Standard GM13
"Test properties, testing frequency, and recommended warrant for high density polyethylene (HDPE) smooth and textured geomembrane"

ENGLISH UNITS

Table 2(a) - High Density Polyethylene (HDPE) Geomembrane - Textured

Property	Test Method	Test Value							Testing Frequency (minimum)
		30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils	
Thickness (min. ave.) • lowest individual for 8 out of 10 values • lowest individual for any of the 10 values	D 5994	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	per roll
Asperity Height (min. ave.)	GM 12	10 mil	10 mil	10 mil	10 mil	10 mil	10 mil	10 mil	every 2nd roll
Density (min. ave.)	D 1505/D792	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	200,000 lb
Tensile Properties (min. ave.) *(1)* • yield stress • break stress • yield elongation • break elongation	D 638 Type IV	63 lb/in. 45 lb/in. 12% 100%	84 lb/in. 60 lb/in. 12% 100%	105 lb/in. 75 lb/in. 12% 100%	126 lb/in. 90 lb/in. 12% 100%	168 lb/in. 120 lb/in. 12% 100%	210 lb/in. 150 lb/in. 12% 100%	252 lb/in. 180 lb/in. 12% 100%	20,000 lb
Tear Resistance (min. ave.)	D 1004	21 lb	28 lb	35 lb	42 lb	56 lb	70 lb	84 lb	45,000 lb
Puncture Resistance (min. ave.)	D 4833	45 lb	60 lb	75 lb	90 lb	120 lb	150 lb	180 lb	45,000 lb
Stress Crack Resistance *(2)*	D 5397 (App.)	200 hr.	200 hr.	200 hr.	200 hr.	200 hr.	200 hr.	200 hr.	per GRI-GM 10
Carbon Black Content (range)	D 1603 *(3)*	2.0 - 3.0%	2.0 - 3.0%	2.0 - 3.0%	2.0 - 3.0%	2.0 - 3.0%	2.0 - 3.0%	2.0 - 3.0%	20,000 lb
Carbon Black Dispersion	D 5596	note *(4)*	note *(4)*	note *(4)*	note *(4)*	note *(4)*	note *(4)*	note *(4)*	45,000 lb
Oxidative Induction Time (OIT) (min. ave.) *(5)* (a) Standard OIT — or — (b) High Pressure OIT	 D 3895 D 5885	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	200,000 lb
Oven Aging at 85°C *(5), (6)* (a) Standard OIT (min. ave.) - % retained after 90 days — or — (b) High Pressure OIT (min. ave.) - % retained after 90 days	D 5721 D 3895 D 5885	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	per each formulation
UV Resistance *(7)* (a) Standard OIT — or — (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs *(9)*	GM11 D 3895 D 5885	 N.R. *(8)* 50%	 N.R. *(8)* 50%	 N.R. *(8)* 50%	 N.R. *(8)* 50%	 N.R. *(8)* 50%	 N.R. *(8)* 50%	 N.R. *(8)* 50%	per each formulation

(1) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction
Yield elongation is calculated using a gage length of 1.3 inches
Break elongation is calculated using a gage length of 2.0 inches

(2) The SP-NCTL test is not appropriate for testing geomembranes with textured or irregular rough surfaces. Test should be conducted on smooth edges of textured rolls or on smooth sheets made from the same formulation as being used for the textured sheet materials.
The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.

(3) Other methods such as D 4218 (muffle furnace) or microwave methods are acceptable if an appropriate correlation to D1603 (tube furnace) can be established.

(4) Carbon black dispersion for 10 different views:
• all 10 in Categories 1 or 2

(5) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.

(6) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.

(7) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.

(8) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.

(9) UV resistance is based on percent retained value regardless of the original HP-OIT value.

Table 5.7 Friction values and efficiencies (in parentheses) for (a) soil-to-geomembrane, (b) geomembrane-to-geotextile, and (c) soil-to-geotextile combinations*

(a) Soil-to-Geomembrane Friction Angles

	Soil Types		
Geomembrane	*Concrete Sand* ($\phi = 30°$)	*Ottawa Sand* ($\phi = 28°$)	*Micha Schist Sand* ($\phi = 26°$)
EPDM-R	24° (0.77)	20° (0.68)	24° (0.91)
PVC			
Rough	27° (0.88)	—	25° (0.96)
Smooth	25° (0.81)	—	21° (0.79)
CSPE-R	25° (0.81)	21° (0.72)	23° (0.87)
HDPE	18° (0.56)	18° (0.61)	17° (0.63)

(b) Geomembrane-to-Geotextile Friction Angles

	Geomembrane				
		PVC			
Geotextile	*EPDM-R*	*Rough*	*Smooth*	*CSPE-R*	*HDPE*
Nonwoven, needle punched	23°	23°	21°	15°	8°
Nonwoven, heat bonded	18°	20°	18°	21°	11°
Woven, monofilament	17°	11°	10°	9°	6°
Woven, slit film	21°	28°	24°	13°	10°

(c) Soil-to-Geotextile Friction Angles

	Soil Types		
Geotextile	*Concrete Sand* ($\phi = 30°$)	*Ottawa Sand* ($\phi = 28°$)	*Mica Schist Sand* ($\phi = 26°$)
Nonwoven, needle punched	30° (1.00)	26° (0.92)	25° (0.96)
Nonwoven, heat bonded	26° (0.84)	—	—
Woven, monofilament	26° (0.84)	—	—
Woven, slit film	24° (0.77)	24° (0.84)	23° (0.87)

*Efficiency values in parentheses are based on the relationship $E = (\tan \delta)/(\tan \phi)$.

Source: After Martin et al. [14].

The frictional behavior of geomembranes placed on clay soils is of considerable importance in the composite liners of waste landfills. Current requirements are for the clay to have a hydraulic conductivity equal to or less than 2×10^{-7} ft./min. (1×10^{-7} cm/sec.) and for the geomembrane to be placed directly on the clay. While an indication of the shear strength parameters has been investigated (e.g., reference 15), the data are so sensitive to the variables listed previously that site-specific and material-specific tests should always be performed. In such cases, literature values should never be used for final design purposes.

5.1.3.9 Geomembrane Anchorage In certain problem situations a geomembrane might be sandwiched between two materials and then tensioned by an external force. The termination of a geomembrane liner within an anchor trench is such a situation. To simulate this behavior in a laboratory environment, one can use an 8.0-in. (200-mm)-wide geomembrane sandwiched between back-to-back channels.

ATTACHMENT H-4

NOAA RAINFALL DATA

File No. 09199033.09

SUBJECT: National Oceanic and Atmospheric Administration (NOAA) National Weather Service Rainfall Data, Hardee County Landfill Expansion
Hardee County, Florida

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*The NOAA data shows that the year of 1998 represents the year with the greatest amount of rainfall (as seen on Sheet 1 of this attachment). The daily rainfall data for 1998 was inserted into the HELP model in year 20, this year represented the year with the greatest amount of rainfall.

HARDEE COUNTY LANDFILL
HARDEE COUNTY, FLORIDA
MONTHLY RAINFALL DATA 1990-2003

Month	Rainfall (inch)
Jan-90	0.14
Feb-90	4.96
Mar-90	0.68
Apr-90	2.71
May-90	2.05
Jun-90	5.34
Jul-90	10.76
Aug-90	10.8
Sep-90	5.65
Oct-90	1.43
Nov-90	0.45
Dec-90	1.03
1990 Total:	46.00

Month	Rainfall (inch)
Jan-91	2.59
Feb-91	1.31
Mar-91	4.35
Apr-91	4.18
May-91	4.05
Jun-91	12.94
Jul-91	10.25
Aug-91	7.37
Sep-91	2.21
Oct-91	3.47
Nov-91	0.12
Dec-91	0.28
1991 Total:	53.12

Month	Rainfall (inch)
Jan-92	0.3
Feb-92	5.21
Mar-92	2.07
Apr-92	6.44
May-92	1.61
Jun-92	12.75
Jul-92	2.91
Aug-92	12.76
Sep-92	4.95
Oct-92	2.95
Nov-92	1.55
Dec-92	0.69
1992 Total:	54.19

Month	Rainfall (inch)
Jan-93	5.93
Feb-93	2.15
Mar-93	5.52
Apr-93	4.34
May-93	2.42
Jun-93	7.62
Jul-93	7.47
Aug-93	6.24
Sep-93	5.23
Oct-93	5.16
Nov-93	0.72
Dec-93	1.27
1993 Total:	54.07

Month	Rainfall (inch)
Jan-94	3.2
Feb-94	1.58
Mar-94	3.34
Apr-94	1.45
May-94	2.71
Jun-94	13.04
Jul-94	7.29
Aug-94	7.44
Sep-94	no data
Oct-94	no data
Nov-94	no data
Dec-94	no data
1994 Total:	40.05

Month	Rainfall (inch)
Jan-95	no data
Feb-95	no data
Mar-95	no data
Apr-95	6.6
May-95	0.65
Jun-95	8.56
Jul-95	11.41
Aug-95	9.99
Sep-95	5.58
Oct-95	8.64
Nov-95	1.45
Dec-95	0.33
1995 Total:	53.21

Month	Rainfall (inch)
Jan-96	2.67
Feb-96	1.38
Mar-96	3.79
Apr-96	0.76
May-96	4.25
Jun-96	4.24
Jul-96	3.71
Aug-96	8.56
Sep-96	7.83
Oct-96	3.49
Nov-96	0.74
Dec-96	2.51
1996 Total:	43.93

Month	Rainfall (inch)
Jan-97	0.44
Feb-97	0.3
Mar-97	2.6
Apr-97	5.95
May-97	2.85
Jun-97	7.42
Jul-97	12.26
Aug-97	8.66
Sep-97	5.38
Oct-97	3.24
Nov-97	10.38
Dec-97	6.29
1997 Total:	65.77

Month	Rainfall (inch)
Jan-98	6.09
Feb-98	8.82
Mar-98	12.14
Apr-98	2.53
May-98	3.57
Jun-98	1.69
Jul-98	6.78
Aug-98	7.58
Sep-98	10.19
Oct-98	1.76
Nov-98	3.34
Dec-98	1.56
1998 Total:	66.05

Month	Rainfall (inch)
Jan-99	3.73
Feb-99	0.8
Mar-99	0.87
Apr-99	2.65
May-99	2.47
Jun-99	4.08
Jul-99	2.9
Aug-99	7.26
Sep-99	5.5
Oct-99	5.61
Nov-99	2
Dec-99	2.4
1999 Total:	40.27

Month	Rainfall (inch)
Jan-00	0
Feb-00	0
Mar-00	0.85
Apr-00	1.4
May-00	0
Jun-00	3.18
Jul-00	5.8
Aug-00	5.62
Sep-00	10.47
Oct-00	0
Nov-00	0.79
Dec-00	1.45
2000 Total:	29.56

Month	Rainfall (inch)
Jan-01	0
Feb-01	0
Mar-01	6.98
Apr-01	0
May-01	5.37
Jun-01	9.16
Jul-01	13.31
Aug-01	6.15
Sep-01	7.03
Oct-01	0.67
Nov-01	0.8
Dec-01	0
2001 Total:	49.47

Month	Rainfall (inch)
Jan-02	2.02
Feb-02	6.03
Mar-02	0
Apr-02	4.28
May-02	1.77
Jun-02	9.02
Jul-02	7.17
Aug-02	7.24
Sep-02	3.46
Oct-02	4.87
Nov-02	8.46
Dec-02	7.89
2002 Total:	62.21

Month	Rainfall (inch)
Jan-03	1.28
Feb-03	**2.05**
Mar-03	**2.02**
Apr-03	**3.45**
May-03	**5.07**
Jun-03	**11.9**
Jul-03	**4.4**
Aug-03	**12.28**
Sep-03	**no data**
Oct-03	**no data**
Nov-03	**no data**
Dec-03	**no data**
2003 Total:	42.45

Source: NOAA Weather Station - Wachula
Coop ID # 089401

See Figure 1 of this Attachment for the weather station location

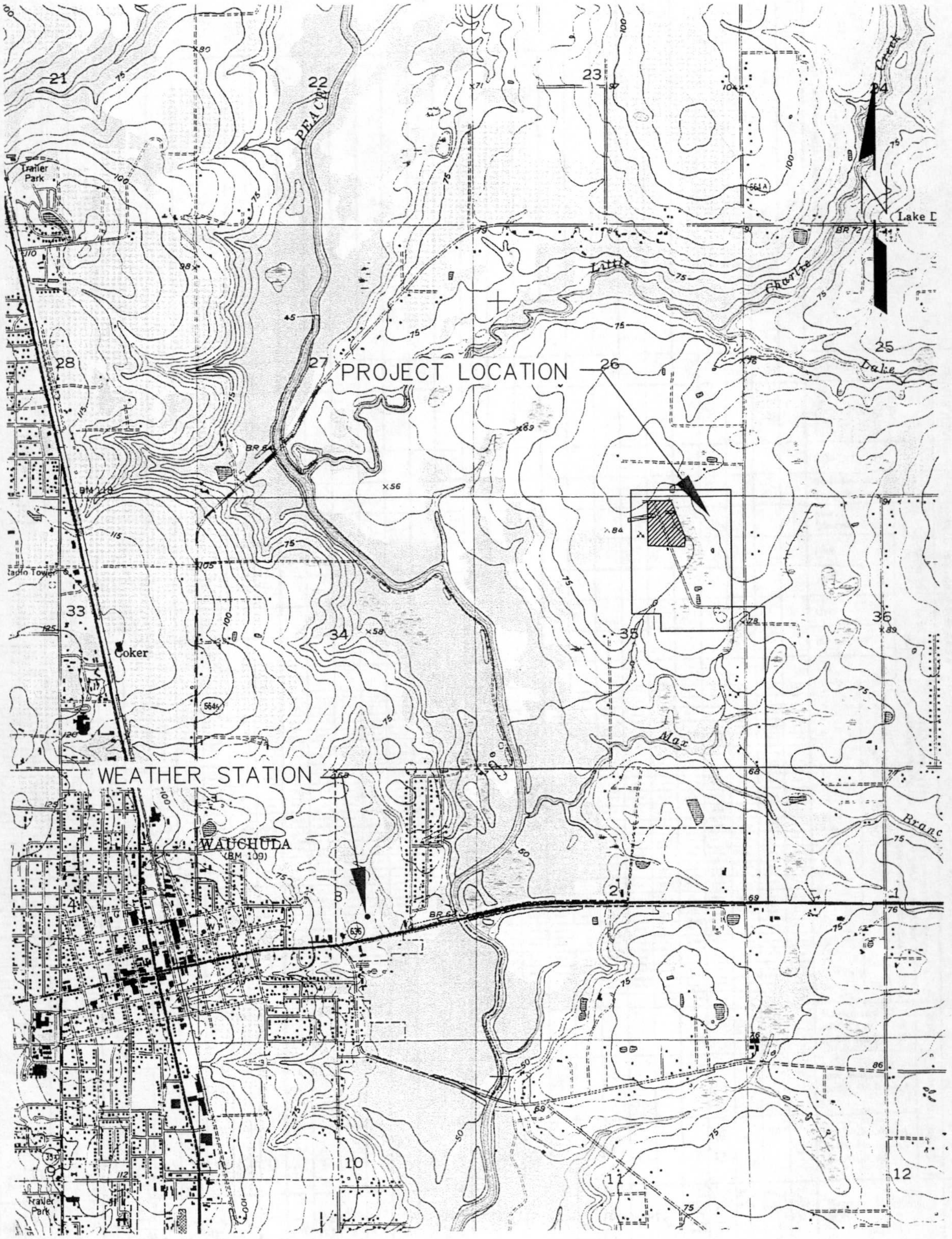
AVERAGE MONTHLY RAINFALL DISTRIBUTION

Month	Rainfall (inch)
Jan	2.18
Feb	2.66
Mar	3.48
Apr	3.34
May	2.77
Jun	7.92
Jul	7.60
Aug	8.43
Sep	6.12
Oct	3.44
Nov	2.57
Dec	2.14
Average:	52.66

Note: Monthly averages do not include months with "No Data' Reported.

Monthy Averages used in the HELP Models. HELP models are located in Attachment H-6

2/14



SCALE: 1" = 3000'

SOURCE: WAUCHULA USGS QUADRANGLE MAP, 1955, Photo Revised 1987

SECTION: 35 TOWNSHIP: 33S RANGE: 25E
SECTION: 26 TOWNSHIP: 33S RANGE: 25E

SCS ENGINEERS

G:\PROJECT\09199033.09\figures\093309USGS.dwg Sep 05, 2003 - 3:9pm By: 1576ho

Figure 1 Approximate location of Weather Station Hardee County Landfill
Hardee County, Florida

STATION (Climatological): Wauchula Waste Water Plant (River Station, if different)
MONTH: Jan 19 95
STATE: Fla
COUNTY: HARDEE
RIVER:
TIME (local) OF OBSERVATION RIVER: 800
TEMP.:
PRECIPITATION:
STANDARD TIME IN USE: E.
TYPE OF RIVER GAGE:
ELEVATION OF RIVER GAGE ZERO: Ft.
FLOOD STAGE: Ft.
NORMAL POOL STAGE: Ft.

WS FORM B-91 (7-89)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins and hundredths)	Snow, ice pellets, (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)	WEATHER (Calendar Day) Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	69	38	39	0													
2	62	38	48	0													
3	76	48	76	0													
4	77	62	71	0													
5	81	68	68	0													
6	81	64	67	0													
7	84	67	76	0													
8	85	73	73	.20													
9	78	62	62	.60													
10	72	50	51	0													
11	69	45	45	0													
12	71	44	47	0													
13	76	47	51	0													
14	71	51	55	0													
15	73	55	65	0													
16	71	65	67	1.75													
17	68	48	54	0													
18	68	47	48	0													
19	69	48	55	0													
20	73	50	51	.5													
21	68	50	57	0													
22	74	57	64	0													
23	79	64	68	0													
24	70	60	67	2.74													
25	68	47	55	.3													
26	61	49	51	0													
27	67	52	65	0													
28	71	52	53	0													
29	65	40	40	0													
30	67	41	42	0													
31	71	43	44	0													
SUM			SUM	6.59			Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds					

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M.

CHECK BAR (For wire-weight) NORML CK. BAR

READING	DATE

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surfa[ce] [sm]ooth ice.
D. Ice gorge a[bove gage].
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER

SUPERVISING OFFICE

STATION INDEX NO. 08-9401 4

3/14

01/15/1994 18:10 9417733907 HARDEE COUNTY S.W. PAGE 05

STATION (Climatological): Wau[redacted] Waste Water Plant (River Station, if different)

MONTH: Feb 19 98

WS FORM B-91 (9)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

STATE: [redacted] ~~[illegible]~~ COUNTY: HARDEE RIVER:

TIME (local) OF OBSERVATION RIVER: 800 TEMP. PRECIPITATION STANDARD TIME IN USE: 8:00 CST

TYPE OF RIVER GAGE ELEVATION OF RIVER GAGE ZERO Ft. FLOOD STAGE Ft. NORMAL POOL STAGE Ft.

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (ins and hundredths)	Snow, ice pellets, hail (ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (ins.)	REMARKS (Special observations, etc.)
1	69	41	41	0			
2	73	40	65	0			Please Send
3	76	64	64	1.53			
4	76	56	58	0			WS FORM B-82
5	65	45	45	0			10-83
6	65	41	50	0			
7	56	41	55	0			I'm using my last
8	58	41	45	0			
9	62	39	40	0			one for March
10	65	39	39	0			
11	73	33	60	0			
12	77	40	61	0			
13	77	46	48	0			
14	64	49	52	.53			
15	65	48	52	0			
16	77	49	49	1.80			
17	79	65	66	4.40			
18	81	59	60	0			
19	80	59	60	0			
20	80	56	60	0			
21	76	48	48	0			
22	76	62	66	0			
23	85	65	65	.56			
24	73	50	55	0			
25	72	43	48	0			
26	76	47	50	0			
27	80	51	45	0			
28	82	63	65	0			
29							
30							
31							
Stat			SUM	[illegible]			

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~~) through hours precipitation probably occurred unobserved. A.M. 1 2 3 4 5 6 7 8 9 10 11 NOON P.M. 1 2 3 4 5 6 7 8 9 10 11

WEATHER (Calendar Day): Mark 'X' for all types occurring each day. Fog | Ice Pellets | Glaze | Thunder | Hail | Damaging Winds

Time of observation if different from above

RIVER STAGE: CONDITION | GAGE READING AT ___ A.M. | TENDENCY

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING | DATE

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER

SUPERVISING OFFICE

STATION INDEX NO. 08-9401-4

4/14

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

WS FORM B-91
(7-89)

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATION (Climatological): Wauchula Waste Water Plant	STATION (River station, if different)	MONTH: March	19 93
STATE: Fla.	COUNTY: Hardee	RIVER	
TIME (local) OF OBSERVATION: RIVER	TEMP: 7 AM	PRECIPITATION: 7 AM	STANDARD TIME IN USE: E.
TYPE OF RIVER GAGE	ELEVATION OF RIVER GAGE ZERO: Ft.	FLOOD STAGE: Ft.	NORMAL POOL STAGE: Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX	MIN	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins and hundredths)	Snow, ice pellets, hail (Ins and tenths)	At Ob Snow, ice pellets, hail, ice on ground (Ins.)
1	52	64	64	.82		
2	86	54	59	0		
3	80	43	57	0		
4	80	43	48	0		
5	80	41	46	0		
6	80	41	70	0		
7	80	41	83	0		
8	85	66	83	1.35		
9	86	64	65	1.35		
10	74	50	51	0		
11	62	41	42	0		
12	62	41	42	0		
13	62	41	43	0		
14	67	37	42	0		
15	73	42	46	0		
16	73	46	47	0		
17	78	56	61	0		
18	80	61	64	0		
19	78	63	65	3.20		
20	66	63	64	4.60		
21	74	59	60	1.42		
22	66	52	54	0		
23	67	48	45	0		
24	70	44	53	0		
25	76	51	63	0		
26	78	51	51	0		
27	79	55	59	0		
28	86	56	83	0		
29	87	61	62	0		
30	84	62	65	0		
31						
SUM			SUM			

Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M.

WEATHER (Calendar Day): Mark 'X' for all types occurring each day — Fog | Ice Pellets | Glaze | Thunder | Hail | Damaging Winds | Time of observation if different from above

RIVER STAGE: CONDITION | GAGE READING AT ___ A.M. | TENDENCY

REMARKS (Special observations, etc.)

CHECK BAR (For wire-weight): NORMAL CK. BAR

READING	DATE

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER

SUPERVISING OFFICE

STATION INDEX NO. 08-9401 4

5/14

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STATION (local) (River Station, if different)	MONTH	YEAR
wa · a Waste Water Plant	April	19 98

STATE	COUNTY	RIVER
Fl	HARDEE	

TIME (local) OF OBSERVATION RIVER	TEMP.	PRECIPITATION	STANDARD TIME IN USE
800	800	800	E

TYPE OF RIVER GAGE	ELEVATION OF RIVER GAGE ZERO	FLOOD STAGE	NORMAL POOL STAGE
	Ft.	Ft.	Ft.

S FORM B-91
-89)

U.S. DEPARTM COMMERCE
NATIONAL OCEANIC AND ATMOSPHE INISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

DATE	TEMPERATURE F. 24 HRS ENDING AT OBSERVATION MAX.	MIN	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (ins and hundredths)	Snow, ice pellets, (ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (ins.)	Draw a straight line (——) through hours precipitation was observed, and a waved line (〰) through hours precipitation probably occurred unobserved. A.M. NOON P.M.	WEATHER (Calendar Day) Mark 'X' for all types occurring each day. Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	87	62	68	0														
2	88	68	71	0														
3	90	65	77	0														
4	87	72	73	0														
5	85	55	57	0														
6	77	53	54	0														
7	78	54	63	0														
8	86	54	69	0														
9	86	68	74	0														
10	83	58	58	0														
11	77	54	54	0														
12	70	44	44	0														
13	77	44	49	0														
14	79	50	51	0														
15	84	52	50	0														
16	82	52	50	0														
17	90	53	64	0														
18	89	61	63	0														
19	83	62	70	0														
20	90	68	67	0														
21	80	66	68	2.20														
22	78	57	57	0														
23	79	53	60	0														
24	74	48	72	0														
25	76	50	51	0														
26	81	50	56	0														
27	83	56	59	0														
28	86	59	58	0														
29	87	60	60	0														
30	83	67	69	.33														
31																		
SUM			SUM	2.53			CHECK BAR (For wire-weight) NORMAL CK. BAR	Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds					

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

READING	DATE

OBSERVER

SUPERVISING OFFICE

STATION INDEX NO.
08-9401-4

6/14

STATION (Climatological): Wauchula Waste Water Plant (River Station, if different)

MONTH: May 19 98

STATE: Fl. COUNTY: Hardee RIVER:

TIME (local) OF OBSERVATION RIVER: TEMP. 800 PRECIPITATION 800 STANDARD TIME IN USE: E

TYPE OF RIVER GAGE: ELEVATION OF RIVER GAGE ZERO: Ft. FLOOD STAGE: Ft. NORMAL POOL STAGE: Ft.

WS FORM B-91 (7-89)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (ins. and hundredths)	Snow, ice pellets (ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (ins.)	WEATHER (Calendar Day) Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	83	65	66	.33													
2	85	59	83	0													
3	86	53	53	0													
4	89	53	72	0													
5	86	59	63	.18													
6	87	63	76	0													
7	88	65	66	0													
8	89	66	66	0													
9	91	66	73	0													
10	89	71	72	0													
11	89	71	71	0													
12	90	61	65	0													
13	90	70	71	0													
14	92	60	84	0													
15	90	65	66	0													
16	89	57	70	0													
17	89	57	70	0													
18	89	61	62	0													
19	89	61	63	0													
20	91	62	67	0													
21	91	63	82	0													
22	92	65	66	0													
23	93	65	66	0													
24	93	66	66	0													
25	93	65	67	0													
26	92	66	69	0													
27	93	70	70	0													
28	84	74	74	0													
29	79	70	71	1.50													
30	88	73	73	0													
31	86	72	79	1.56													
Sum			SUM	[illegible]			Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds					

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M.

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING | DATE

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER

SUPERVISING OFFICE

STATION INDEX NO. 08-9401 4

STATION (Climatological): WC Wastewater Plant (River Station, if different)
MONTH: June 19 95

STATE: Fl
COUNTY: Hardee
RIVER:

TIME (local) OF OBSERVATION RIVER: 800
TEMP:
PRECIPITATION:
STANDARD TIME IN USE: E

TYPE OF RIVER GAGE:
ELEVATION OF RIVER GAGE ZERO: Ft.
FLOOD STAGE: Ft.
NORMAL POOL STAGE: Ft.

FORM B-91 (…9)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

DATE	TEMPERATURE F. 24 HRS ENDING AT OBSERVATION MAX.	MIN	AT OBSN	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, hail (Ins. and tenths)	At Ob Snow, ice pellets, hail, ice on ground (Ins.)	WEATHER Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	97	74	76	0													
2	90	73	73	0													
3	93	72	71	0													
4	93	74	76	0													
5	95	72	71	0													
6	96	74	74	0													
7	95	72	72	0													
8	95	71	74	0													
9	89	71	73	0													
10	92	73	75	.126													
11	93	73	80	0													
12	95	73	73	0													
13	96	72	91	0													
14	93	75	92	0													
15	94	73	76	0													
16	94	72	71	0													
17	97	70	72	0													
18	98	70	75	0													
19	98	73	73	0													
20	99	73	77	.13													
21	98	71	71	.18													
22	97	69	70	0													
23	96	70	72	0													
24	97	70	76	0													
25	97	73	74	.95													
26	91	73	74	0													
27	92	69	69	0													
28	93	69	79	0													
29	97	75	76	0													
30	99	75	75	0													
31				0													
SUM			SUM	1.6													

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M.

Mark 'X' for all types occurring each day.

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER

SUPERVISING OFFICE

STATION INDEX NO. 08-9401-4

8/14

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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

(7-89)

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATION (Climatological): WAuChula Waste WATER PlANT
July 19 98

STATE: Fl
COUNTY: HardEE
RIVER:

TIME (local) OF OBSERVATION RIVER | TEMP | PRECIPITATION | STANDARD TIME IN USE: E

TYPE OF RIVER GAGE | ELEVATION OF RIVER GAGE ZERO Ft. | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)
1	98	70	71	0		
2	94	77	78	0		
3	98	71	72	0		
4	96	72	80	0		
5	96	72	74	.37		
6	94	71	74	0		
7	91	74	75	.72		
8	94	73	74	0		
9	94	73	74	0		
10	90	80	80	0		
11	88	76	76	.97		
12	92	76	76	0		
13	94	73	73	.48		
14	93	74	74	.0		
15	89	73	74	1.20		
16	80	75	76	0		
17	91	71	72	0		
18	93	72	84	0		
19	94	73	78	0		
20	92	71	71	.13		
21	90	71	73	0		
22	92	73	74	.3		
23	89	71	72	0		
24	94	72	83	0		
25	95	73	73	0		
26	95	71	76	1.91		
27	95	73	81	0		
28	94	73	81	0		
29	95	75	76	0		
30	95	72	73	.70		
31	95	72	74	0		
SUM			SUM	6.78		

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M. 1 2 3 4 5 6 7 8 9 10 11 | 1 2 3 4 5 6 7 8 9 10 11

WEATHER (Calendar Day): Mark 'X' for all types occurring each day: Fog | Ice Pellets | Glaze | Thunder | Hail | Damaging Winds | Time of observation if different from above

RIVER STAGE: CONDITION | GAGE READING AT ___ A.M. | TENDENCY

REMARKS (Special observations, etc.)

CHECK BAR (For wire-weight) NORMAL CK. BAR: READING | DATE

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface smooth ice.
D. Ice gorge ...
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER

SUPERVISING OFFICE

STATION INDEX NO. 08-9401-4

9/14

WS FORM B-91

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

Wauch lc Waste water Plant — Aug 1 19 9?

STATE: 71 | COUNTY: Hardee | RIVER:

TIME (local) OF OBSERVATION RIVER: 8:00 AM | TEMP | PRECIPITATION | STANDARD TIME IN USE

TYPE OF RIVER GAGE | ELEVATION OF RIVER GAGE ZERO Ft. | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (ins. and hundredths)	Snow, ice pellets (ins. and tenths)	AT OB. Snow, ice pellets, hail, ice on ground (ins.)	WEATHER (Calendar Day): Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE Condition	Gage reading at ___ A.M.	Tendency	REMARKS (Special observations, etc.)
1	94	71	71	0													
2	93	71	71	.20													
3	93	75	76	0													
4	93	73	73	0													
5	92	71	80	0													
6	91	71	72	.20													
7	90	70	72	2.65													
8	91	72	73	1.04													
9	92	73	76	.60													
10	93	74	75	.19													
11	94	74	74	0													
12	94	74	75	0													
13	95	73	80	0													
14	95	73	74	0													
15	95	73	73	0													
16	93	73	74	0													
17	95	74	74	.14													
18	92	74	74	.37													
19	93	73	73	0													
20	93	73	76	0													
21	89	73	76	.44													
22	83	73	74	.44													
23	88	73	75	0													
24	92	72	73	0													
25	91	73	75	0													
26	93	72	72	0													
27	95	74	72	0													
28	93	74	76	1.26													
29	96	73	73	0													
30	93	71	72	[illegible]													
31	94	69	70	.05													
SUM			SUM	7.70													

Precipitation: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M.

CHECK BAR (For wire-weight) NORMAL CK. BAR — READING | DATE

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER

SUPERVISING OFFICE

STATION INDEX NO. 08-9401-4

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BEST AVAILABLE COPY

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HARDEE COUNTY S.W.

9417733907 18:02 01/15/1994

STATION (Climatological) [illegible] Plant | Sept | 19 94

(7-89)

NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATE Florida | COUNTY Hardee | RIVER

TIME (local) OF OBSERVATION RIVER | TEMP. 7:00 | PRECIPITATION 7:00 | STANDARD TIME IN USE E

TYPE OF RIVER GAGE | ELEVATION OF RIVER GAGE ZERO Ft. | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (ins. and hundredths)	Snow, ice pellets, hail (ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (ins.)	WEATHER (Calendar Day)	RIVER STAGE	REMARKS (Special observations, etc.)
1	94	6[illegible]	7[illegible]	0					
2	9[illegible]	6[illegible]	7[illegible]	[illegible]	0.22				
3	86	7[illegible]	7[illegible]	.24					
4	[illegible]	7[illegible]	7[illegible]	.[illegible]	0.50				
5	88	75	77	0					
6	[illegible]	76	7[illegible]	.74					
7	9[illegible]	7[illegible]	74	0	0				
8	9[illegible]	7[illegible]	7[illegible]	[illegible]	0.5				
9	[illegible]	7[illegible]	7[illegible]	0					
10	90	73	80	0					
11	88	71	72	0					
12	54	68	69	0					
13	56	69	80	0					
14	56	67	68	0					
15	88	69	74	.42					
16	88	69	74	.44					
17	84	74	75	0					
18	82	74	74	.55					
19	86	74	71	.29					
20	82	74	75	1.30	1.3				
21	82	73	74	.42					
22	85	73	76	.27					
23	87	73	73	.12					
24	92	73	77	0					
25	[illegible]	77	74	.56					
26	85	71	79	2.67					
27	83	74	78	.35	0.85				
28	88	71	71	0					
29	91	7[illegible]	74	0					
30	90	74	74	0					
31									
SUM			SUM	10.19					

Precipitation: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M.

WEATHER (Calendar Day): Mark 'X' for all types occurring each day. Fog | Ice Pellets | Glaze | Thunder | Hail | Damaging Winds | Time of observation if different from above

RIVER STAGE: CONDITION | GAGE READING AT ___ A.M. | TENDENCY

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge [illegible] gage.
E. Ice gorge below gage
F. Shore ice.
G. Floating ice.
H. Pool stage.

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING | DATE

OBSERVER

SUPERVISING OFFICE

STATION INDEX NO. 08-9401-4

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FORM B-91

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATION (City): Wauchula Waste Water Plant (River Station, if different)
MONTH: Oct 19 98
STATE: Florida
COUNTY: HARDEE
RIVER:
TIME (local) OF OBSERVATION RIVER: 7:00 AM
TEMP:
PRECIPITATION:
STANDARD TIME IN USE: E.
TYPE OF RIVER GAGE:
ELEVATION OF RIVER GAGE ZERO: Ft.
FLOOD STAGE: Ft.
NORMAL POOL STAGE: Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (ins. and hundredths)	Snow, ice pellets (ins. and tenths)	At Ob Snow, ice pellets, hail, ice on ground (ins.)	WEATHER (Calendar Day) Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	89	74	77	0													
2	88	76	78	0													
3	88	71	81	0													
4	90	70	73	0													
5	91	71	71	0													
6	92	72	76	0													
7	91	72	74	0													
8	90	71	72	0													
9	89	71	73	0													
10	89	73	70	0													
11	89	[illegible]	70	0													
12	89	68	71	0													
13	89	71	72	.46													
14	87	68	69	0													
15	85	65	65	0													
16	86	65	67	0													
17	86	66	67	0													
18	85	65	85	0													
19	87	64	72	0													
20	87	65	74	0													
21	89	73	75	.95													
22	86	71	74	.35													
23	81	60	62	0													
24	76	61	63	0													
25	83	63	63	0													
26	82	63	67	0													
27	83	68	66	0													
28	83	59	63	0													
29	82	57	71	0													
30	82	56	70	0													
31	84	56	75	0													
Sum			SUM	1.76			Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds					

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M.

WEATHER: Mark 'X' for all types occurring each day.

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER

SUPERVISING OFFICE

STATION INDEX NO. 08-9401-4

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WS FORM B-91
(7-89)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATION (Climatological): Wauchula Waste Water Plant (River Station, if different):
MONTH: NOV 19 98
STATE: Fl. COUNTY: HARDEE RIVER:
TIME (local) OF OBSERVATION RIVER: 700 — TEMP. 700 PRECIPITATION 700 STANDARD TIME IN USE: E.
TYPE OF RIVER GAGE: ELEVATION OF RIVER GAGE ZERO: Ft. FLOOD STAGE: Ft. NORMAL POOL STAGE: Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)	WEATHER (Calendar Day) Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	84	59	59	0													
2	85	59	67	0													
3	85	59	68	0													
4	85	58	69	0													
5	72	65	65	3.25													
6	72	51	57	0													
7	76	50	51	0													
8	77	55	56	0													
9	80	57	59	0													
10	80	57	59	0													
11	84	60	61	0													
12	87	60	70	0													
13	83	61	66	0													
14	83	60	61	0													
15	82	58	80	0													
16	85	61	61	0													
17	86	63	65	0													
18	84	64	65	0													
19	84	67	69	0													
20	86	65	66	0													
21	86	65	67	.09													
22	83	67	67	0													
23	83	66	67	0													
24	83	64	66	0													
25	83	64	66	0													
26	82	66	68	0													
27	81	59	77	0													
28	78	51	54	0													
29	76	54	57	0													
30	80	55	55	0													
31																	
SUM			SUM	3.34													

Precipitation: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M. 1 2 3 4 5 6 7 8 9 10 11 1 2 3 4 5 6 7 8 9 10 11

Weather: Mark 'X' for all types occurring each day. Fog, Ice Pel., Glaze, Thund., Hail, Dam. Winds

CHECK BAR (For wire-weight) NORMAL CK. BAR
READING | DATE

CONDITION OF RIVER AT GAGE
A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER
SUPERVISING OFFICE
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WS FORM B-91

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATION (Climatological): Wauc[illegible] Waste Water Plant (River Station, if different)
MONTH: Dec 19 98
STATE: Fl
COUNTY: HARDEE
RIVER:
TIME (local) OF OBSERVATION RIVER: 700 TEMP. PRECIPITATION
STANDARD TIME IN USE: E
TYPE OF RIVER GAGE
ELEVATION OF RIVER GAGE ZERO Ft.
FLOOD STAGE Ft.
NORMAL POOL STAGE Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (ins. and hundredths)	Snow, ice pellets, hail (ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (ins.)	Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	83	56	58	0													
2	82	51	61	0													
3	83	59	59	0													
4	82	58	59	0													
5	81	57	58	.25													
6	83	58	63	0													
7	83	55	56	0													
8	83	56	57	0													
9	83	57	58	0													
10	83	57	66	0													
11	82	66	67	.13													
12	78	67	68	0													
13	81	67	70	0													
14	82	61	61	.30													
15	62	51	51	0													
16	68	42	42	0													
17	65	39	39	0													
18	71	37	37	0													
19	70	50	54	0													
20	76	54	65	0													
21	83	65	65	0													
22	83	59	60	0													
23	82	58	62	0													
24	82	59	61	0													
25	84	60	62	0													
26	83	62	65	0													
27	72	54	55	0													
28	78	54	62	0													
29	65	60	61	.67													
30	78	56	56	.21													
31	63	40	43	0													
Sum			SUM	1.56													

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M. 1 2 3 4 5 6 7 8 9 10 11 / 1 2 3 4 5 6 7 8 9 10 11

WEATHER (Calendar Day): Mark 'X' for all types occurring each day.

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

CONDITION OF RIVER AT GAGE
A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER

SUPERVISING OFFICE

STATION INDEX NO. 08-9401-4

ATTACHMENT H-5

GEOCOMPOSITE CALCULATIONS

File No. 09199033.09

SUBJECT: Transmissivity/Hydraulic Conductivity Calculations,
Hardee County Landfill Expansion
Hardee County, Florida

Table of Contents

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Transmissivity / Hyraulic Conductivity Calculations	LEK	
	CHECKED JHW	DATE

Purpose: Determine the hydraulic conductivity of biplanar & triplanar geocomposite materials for the lateral drainage layer component of the primary and secondary collection system.

Guidelines:

1. Geosynthetic Research Institute (GRI) Standard - GC8
   "Determination of the Allowable Flow Rate of a Drainage Geocomposite"
2. www.landfilldesign.com
3. 62-701.400(3)(c)(2), FAC
   "The secondary leachate collection system shall have a minimum hydraulic conductivity of 10 cm/s."

Approach:

$$T_{ALLOWABLE} = \frac{T_{ULTIMATE}}{RF_{IN} \times RF_{CC} \times RF_{BC} \times RF_{CR} \times FS}$$

$T_{ALLOWABLE}$ = allowable transmissivity, cm^2/s

$T_{ULTIMATE}$ = ultimate transmissivity, obtained from manufacturer's data, cm^2/s

RF_{IN} = intrusion reduction factor

RF_{CC} = chemical clogging reduction factor

RF_{BC} = biological clogging reduction factor

RF_{CR} = creep reduction factor, provided by manufacturer

FS = factor of safety

$$k = \frac{T_{ALLOWABLE}}{t'}$$

k = hydraulic conductivity, cm/s

t' = geonet thickness after extensive loading = $\frac{\text{Virgin geonet thickness}}{RF_{CR}}$, cm

Note:

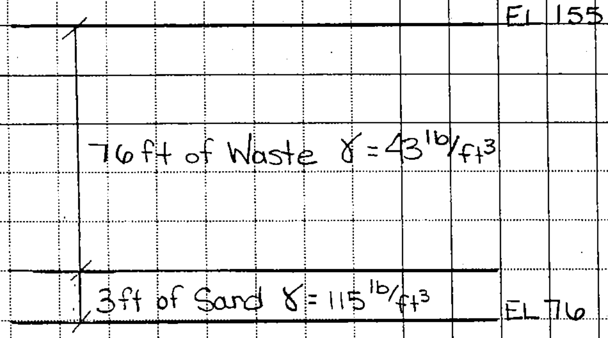
RF_{IN} accounts for the geotextile encroaching on the geonet under a constant loading. A 100-hour transmissivity test accounts for intrusion. After the 100-hour seat time, the geotextile has already begun to intrude into the geonet; therefor the transmissivity value reflects intrusion. The transmissivity values for these calculations are all based on the 100 hour test; therefor $RF_{IN} = 1.0$

SCS ENGINEERS

CLIENT: Hardee County	PROJECT: Landfill Expansion	JOB NO. 09199033.09	
SUBJECT: Transmissivity Calculations		BY: LEK	DATE: 8/7/03
Over Burden Pressure		CHECKED: JHO	DATE:

Purpose:

To calculate the overburden pressure.



$$\text{Overburden Pressure} = \text{Distance} \times \text{Unit Weight}$$
$$= 3\text{ft} \times 115\ \text{lb}/\text{ft}^3 + 76\text{ft} \times 43\ \text{lb}/\text{ft}^3$$
$$= 3613\ \text{lb}/\text{ft}^2$$
$$= 25\ \text{lb}/\text{in}^2$$

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
Transmissivity Calculations (Primary System)		LFK	9/2/03
Open Cell Scenario (Biplanar)		CHECKED JH	DATE

PURPOSE

To calculate the design transmissivity of a biplanar geocomposite for an open cell prior to waste placement

At a loading condition of 5000 psf, a hydraulic gradient of 0.02, and a seat period of 100 hours. (Attachment 1)

$T_{ult} = 2.7 \times 10^{-3}\ m^2/sec = 27\ \frac{cm^2}{s}$

$t = 300\ mils = 0.762\ cm$

REDUCTION FACTORS (primary system)

$RF_{INTRUSION}$ = Accounted for in ultimate transmissivity value

$RF_{CHEMICAL\ CLOGGING} = 1$

$RF_{BIOLOGICAL\ CLOGGING} = 1$

$FS = 2$

$T_{ALLOWABLE} = \frac{27\ cm^2/sec}{1.0 \times 1.0 \times 2.0} = 13.5\ cm^2/sec$

$t' = \frac{0.762\ cm}{1.0} = 0.762\ cm = 0.3\ inch$

$k = \frac{13.5\ cm^2/sec}{0.762\ cm} = 17.7\ cm/sec$

Used in HELP model, Case 1

NEW BI-PLANAR

Note: the open cell does not have any waste in it yet, therefore, the chemical / biological is not a factor.

SCS ENGINEERS

CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09
SUBJECT Transmissivity Calculations (Secondary System) Open Cell Scenario (TRIPLANAR)	BY LEK / CHECKED JHD	DATE 9/2/03 / DATE

PURPOSE:

To calculate the design transmissivity of a triplanar geocomposite for an open cell prior to waste placement.

At a loading condition of 5000 psf, a hydraulic gradient of 0.02, and a seat period of 100 hours (Attachment 2)

$$T_{ult} = 4.0 \times 10^{-3} \, m^2/sec$$
$$= 40 \, cm^2/sec$$

REDUCTION FACTORS (secondary system)

$RF_{INTRUSION}$ = Accounted for in ultimate transmissivity value

$RF_{CHEMICAL\ CLOGGING} = 1$ (TENAX, JP KLINE)

$RF_{BIOLOGICAL\ CLOGGING} = 1$ (TRI, Sam Allen)

$FS = 2$

Note: The open cell does not have any waste in it yet, therfore the chemical/biological clogging is not a factor.

$$T_{ALLOWABLE} = \frac{40 \, cm^2/sec}{1.0 \times 1.0 \times 2.0} = 20 \, cm^2/sec$$

$$t' = 300 \text{ mils} = 0.3 \text{ inches} = 0.762 \text{ cm}$$

Note: Since only 2' of sand is over the geocomposite, CREEP is minimal.

$$k = \frac{20 \, cm^2/sec}{0.762 \, cm} = 26.2 \, cm/sec$$

Used in HELP Model, Case 1

New Triplanar

SCS ENGINEERS

CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09
SUBJECT Transmissivity/Hydraulic Conductivity Calcs (Primary System) 10 ft Waste Lift (Biplanar)	BY LEK	DATE 1/13/04
	CHECKED JHD	DATE

Calculate the design transmissivity / hydraulic conductivity of a biplanar geocomposite for a 10 ft lift of waste for a primary leachate collection system.

At a loading of 5000 psf, a hydraulic gradient of 0.02 and a seat period of 100 hours (Attachment 1)

$T_{ult} = 2.7 \times 10^{-3}\ m^2/s = 27\ cm^2/s$

$t = 300\ mils = 0.3\ inch = 0.762\ cm$

Reduction Factors for a primary system

$RF_{INTRUSION}$ = Accounted for in ultimate transmissivity value

$RF_{CHEMICAL\ CLOGGING} = 2.0$ (see Attachment 3, GC-8, P.9/11)

$RF_{BIOLOGICAL\ CLOGGING} = 1.3$ (see Attachment 3, GC-8, P.9/11)

$RF_{CREEP} = 1.02$ (see Attachment 4, GSE Creep Info)

$FS = 2.0$

$$T_{ALLOWABLE} = \frac{27\ cm^2/s}{1.0 \times 2.0 \times 1.3 \times 1.02 \times 2.0} = 5.1\ cm^2/s$$

$$t' = \frac{0.762\ cm}{1.02} = 0.747\ cm = 0.294\ inch$$ (max allowable head on liner)

$$k = \frac{5.1\ cm^2/s}{0.747\ cm} = 6.8\ cm/s$$

Used in HELP model, Case 2, 3, & 4

LONG-TERM Biplanar

SCS ENGINEERS

SHEET 6 OF 7

CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09
SUBJECT Geocomposite Calculations (Primary System) 40' & 69.5' Waste Lift (Biplanar)	BY LEK CHECKED	DATE 9/2/03 DATE

PURPOSE:

To calculate the design transmissivity of a biplanar geocomposite for a 10 ft waste lift.

At a loading condition of 5000 psf, a hydraulic gradient of 0.02 and a seat period of 100 hours (Attachment 1)

$T_{ult} = 2.7 \times 10^{-3}\ m^2/sec$

$t = 300\ mils = 0.762\ cm$

REDUCTION FACTORS (primary system)

$RF_{INTRUSION}$ = Accounted for in ultimate transmissivity value

$RF_{CHEMICAL\ CLOGGING} = 2.0$ (See Attachment 3, GC-8, P.9/11)

$RF_{BIOLOGICAL\ CLOGGING} = 1.3$ (See Attachment 3, GC-8, P.9/11)

$RF_{CREEP} = 1.1$ (See Attachment 4, GSE Creep Info)

FS = 2

$$T_{ALLOWABLE} = \frac{27\ cm^2/sec}{2.0 \times 1.3 \times 1.1 \times 2} = 4.7\ cm^2/sec$$

$$t' = \frac{0.762\ cm}{1.1} = 0.693\ cm = 0.273\ inch$$

$$K = \frac{T_{ALLOWABLE}}{t'} = \frac{4.7\ cm^2/s}{0.693\ cm} = 6.8\ cm/s$$

Used in HELP Model Case 2, 3, & 4

Long Term Triplanar

t' represents the maximum allowable head on the liner

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Geocomposite Calculations (Secondary System All ft Waste Lift (TRIPLANAR)	LEK	9/2/03
	CHECKED JHO	DATE

PURPOSE:

To calculate the design transmissivity of a triplanar geocomposite for a 10 ft waste lift.

At a loading condition of 5000 psf, a hydraulic gradient of 0.02, and a seat period of 100 hours (Attachment 2)

$T_{ult} = 4.0 \times 10^{-3}\ M^2/sec$

$t = 300$ Mils $= 0.762$ CM

REDUCTION FACTORS (secondary system)

$RF_{INTRUSION}$ = Accounted for in ultimate transmissivity value

$RF_{CHEMICAL\ CLOGGING} = 1.5$ (See Attachment 3, GC-8, P.9/11)

$RF_{BIOLOGICAL\ CLOGGING} = 1.3$ (See Attachment 3, GC-8, P.9/11)

$RF_{CREEP} = 1.2$ (See Attachment 5, Tenax Creep Info)

$FS = 2$

$$T_{ALLOWABLE} = \frac{40\ CM^2/sec}{1.5 \times 1.3 \times 1.2 \times 2} = 8.5\ CM^2/sec$$

$$t' = \frac{0.762\ CM}{1.2} = 0.635\ CM = 0.25\ inch$$

$$k = \frac{T_{ALLOWABLE}}{t'} = \frac{8.5\ CM^2/s}{0.635\ CM} = 13.4\ CM/s$$

Used in HELP Model, Case 2,3 & 4

t' represents the maximum allowable head on the liner

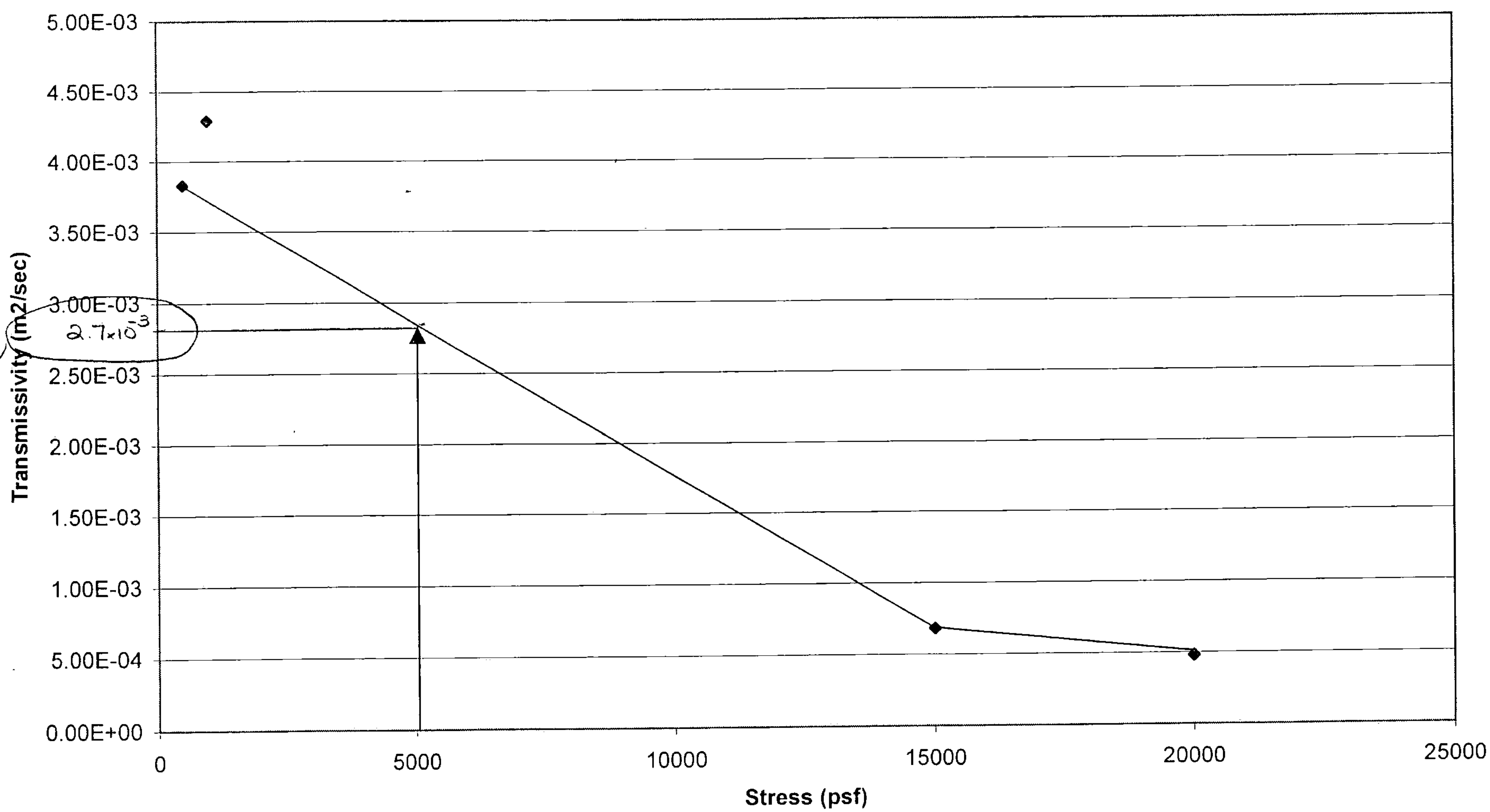
ATTACHMENTS

FABRINET UF

Stress vs. Transmissivity at 0.02 Gradient

Boundary Conditions: Soil/Geocomposite/Geomembrane

100-hour Data



The value of $2.7 \times 10^{-3} \frac{M^2}{S}$ was used as the ultimate transmissivity for biplanar mat'l.

$T_{ULTIMATE} = 2.7 \times 10^{-3} \frac{M^2}{S}$

Source: Dhani Narejo
Email
8/13/03

Attachment 1
1/1

Attachment 2

1/1

TENAX® Corporation
1635 Jamestown Place
Pittsburgh, Pennsylvania 15235
Phone: 412-371-2973 Corporate
Fax: 412-371-2974 Office: 800-356-8495

19 March 2004

Lindsey Kennelly
SCS Engineers
3012 U.S. Hwy. 301 North
Suite 700
Tampa, FL 33619

Fax # 813-623-6757

Lindsey,

Please find below the minimum transmissivity values for the Tendrain 770-2 (300 mil (minimum) tri-planar geonet with 6 oz/sy geotextile laminated to both sides) tested at a normal pressure of 5000 psf for a 100 hour duration.

<u>Test configuration: plate / uniform sand / geocomposite / text. geomembrane / plate</u>
4.0E-3 m^2/sec @ gradient of 0.02
2.8E-3 m^2/sec @ gradient of 0.1

<u>Test configuration: plate / geomembrane / geocomposite / geomembrane / plate</u>
5.5E-3 m^2/sec @ gradient of 0.02
3.0E-3 m^2/sec @ gradient of 0.1

Please note that I have also included transmissivity values at a gradient of 0.1. We recommend for specification and conformance testing that gradients of less than 0.1 not be used due to the significant increase in testing variability at such low gradients.

Please contact me if you have any questions or need further assistance.

Sincerely,

J. P. Kline
Regional Engineer
Tenax Corporation

Performance in Plastic Technology℠

Attachment 3
GC-8
1/11

Drexel
UNIVERSITY

Geosynthetic Research Institute
475 Kedron Avenue
Folsom, PA 19033-1208 USA
TEL (610) 522-8440
FAX (610) 522-8441

GRI GEI GII GSI GAI GCI

Original: April 17, 2001

GRI Standard – GC8

Standard Guide for

Determination of the Allowable Flow Rate of a Drainage Geocomposite

1. Scope

1.1 This guide presents a methodology for determining the allowable flow rate of a candidate drainage geocomposite. The resulting value can be used directly in a hydraulics-related design to arrive at a site-specific factor of safety.

1.2 The procedure is to first determine the candidate drainage composite's flow rate for 100-hours under site-specific conditions, and then modify this value by means of creep reduction and clogging reduction factors.

1.3 For aggressive liquids, a "go-no go" chemical resistance procedure is suggested. This is a product-specific verification test for both drainage core and geotextile covering.

1.4 The type of drainage geocomposites under consideration necessarily consists of a drainage core whose purpose it is to convey liquid within its manufactured plane. The drainage core can be a geonet, 3-D mesh, built-up columns, single or double cuspations, etc.

1.5 The drainage core usually consists of a geotextile on its upper and/or lower surface. In some cases, the drainage core is used by itself. The guide addresses all of these variations.

1.6 The guide is also applicable to thick nonwoven geotextiles when they are utilized for their drainage capability.

1.7 All types of polymers are under consideration in this guide.

1.8 The guide does not address the <u>required (or design)</u> flow rate to which a comparison is made for the final factor of safety value. This is clearly a site-specific issue.

2. Referenced Documents

2.1 ASTM Standards
D1987 – "Test Method for Biological Clogging of Geotextile or Soil/Geotextile Filters"
D2240 – "The Method for Rubber Property – Durometer Hardness"
D4716 – "Test Method for Constant Head Hydraulic Transmissivity (In Plane Flow) of Geotextiles and Geotextile Related Products"

D5322 – "Standard Practice for Immersion Procedures for Evaluating the Chemical Resistance of Geosynthetics to Liquids"
D6364 – "Test Method for Determining the Short-Term Compression Behavior of Geosynthetics"
D6388 – "Standard Practice for Tests to Evaluate the Chemical Resistance of Geonets to Liquids"
D6389 – "Standard Practice for Tests to Evaluate the Chemical Resistance of Geotextiles to Liquids"

2.2 GRI Standards
GS 4 Test Method for Time Dependent (Creep) Deformation Under Normal Pressure

2.3 Literature
Giroud, J.-P., Zhao, A. and Richardson, G. N. (2000), "Effect of Thickness Reduction on Geosynthetic Hydraulic Transmissivity," Geosynthetics International, Vol. 7, Nos. 4-6, pp. 433-452.
Koerner, R. M. (1998), Designing with Geosynthetics, Prentice Hall Publishing Co., Englewood Cliffs, NJ, 761 pgs.

3. Summary of Guide

3.1 This guide presents the necessary procedure to be used in obtaining an allowable flow rate of a candidate drainage geocomposite. The resulting value is then compared to a required (or design) flow rate for a product-specific and site-specific factor of safety. The guide does not address the required (or design) flow rate value, nor the subsequent factor of safety value.
3.2 The procedures recommended in this guide use either ASTM or GRI test methods.
3.3 The guide is applicable to all types of drainage geocomposites regardless of their core configuration or geotextile type. It can also be used to evaluate thick nonwoven geotextiles.

4. Significance and Use

4.1 The guide is meant to establish uniform test methods and procedures in order for a designer to determine the allowable flow rate of a candidate drainage geocomposite for site-specific conditions.
4.2 The guide requires communication between the designer, testing organization and manufacturer in setting site-specific control variables such as product orientation, stress level, stress duration, type of permeating liquid and materials below/above the geocomposite test specimen.
4.3 The guide is useful to testing laboratories in that a prescribed guide is at hand to provide appropriate data for both designer and manufacturer clients.

5. Structure of the Guide

5.1 Basic Formulation – This guide is focused on determination of a "q_{allow}" value using the following formula:

$$q_{allow} = q_{100}\left[\frac{1}{RF_{CR} \times RF_{CC} \times RF_{BC}}\right] \tag{1}$$

where

q_{allow} = allowable flow rate
q_{100} = initial flow rate determined under simulated conditions for 100-hour duration
RF_{CR} = reduction factor for creep to account for long-term behavior
RF_{CC} = reduction factor for chemical clogging
RF_{BC} = reduction factor for biological clogging

> Note 1: By simulating site-specific conditions (except for load duration beyond 100 hours and chemical/biological clogging), additional reduction factors such as intrusion need not be explicitly accounted for.
>
> Note 2: The value of q_{allow} is typically used to determine the product-specific and site-specific flow rate factor of safety as follows:
>
> $$FS = \frac{q_{allow}}{q_{reqd}} \tag{2}$$
>
> The value of "q_{reqd}" is a design issue and is not addressed in this guide. Likewise, the numeric value of the factor-of-safety is not addressed in this guide. Suffice it to say that, depending on the duration and criticality of the situation, FS-values should be conservative unless experience allows otherwise.

5.2 Upon selecting the candidate drainage geocomposite product, one must obtain the 100-hour duration flow rate according to the ASTM D4716 transmissivity test. This establishes the base value to which drainage core creep beyond 100-hours and clogging from chemicals and biological matter must be accounted for.

> Note 3: It is recognized that the default duration listed in ASTM D4716 is 15-minutes. This guide purposely requires that the test conditions be maintained for 100-hours.

5.3 Reduction Factor for Creep – This is a long-term (typically 10,000 hours) compressive load test focused on the stability and/or deformation of the drainage core without the covering geotextiles. Stress orientation can be perpendicular or at an angle to the test specimen depending upon site-specific conditions.

Attachment 3
GC-8
4/11

5.4 Chemical and/or Biological Clogging – The issue of long term reduction factors to account for clogging within the core space is a site-specific issue. The issue is essentially impractical to simulate in the laboratory, hence a table is provided for consideration by the designer.

5.5 Chemical Resistance/Durability – This procedure results in a "go-no go" decision as to potential chemical reactions between the permeating liquid and the polymers comprising the drainage core and geotextiles. The issue will be addressed in this guide but is not a reduction factor, per se.

6. Determination of the Base Line Flow Rate (q_{100})

6.1 Using the ASTM D4716 transmissivity test with the conditions stated below (unless otherwise agreed upon by the parties involved), determine the 100-hour flow rate of the drainage geocomposite under consideration.

6.1.1 The test specimen shall be the entire geocomposite. If geotextiles are bonded to the drainage core, they shall not be removed and the entire geocomposite shall be tested as a unit. A minimum of three replicate samples in the site-specific orientation shall be tested and the results averaged for the reported value.

6.1.2 Specimen size shall be 300 × 300 mm (12 × 12 in.) within the stressed area.

6.1.3 The specimen orientation is to be agreed upon by the designer, testing laboratory and manufacturer. In this regard, it should be recognized that the specimen orientation during testing has to match the proposed installation orientation. Thus the site-specific design governs both the testing orientation and subsequent field installation orientation.

6.1.4 Specimen substratum shall be one of the following four options. The decision of which is made by the project designer, testing organization and manufacturer. The options are (i) rigid platen, (ii) foam, (iii) sand or (iv) site-specific soil or other material.

6.1.4.1 If a rigid platen is used the choices are usually wood, plastic or metal. The testing laboratory must identify the specifics of the material used.

6.1.4.2 If closed cell foam is used, it shall be 12 mm (0.5 in.) thick and a maximum durometer of 2.0 as measured in ASTM D2240, Type D.

6.1.4.3 If sand is used it shall be Ottawa test sand at a relative density of 85%, water content of 10% and compacted thickness of 25 mm (1.0 in.).

6.1.4.4 If site-specific soil or other material is used it must be carefully considered and agreed upon between the parties involved. Size, gradation, moisture content, density, etc., are all important considerations.

6.1.5 Specimen superstratum shall also be one of the four same options as mentioned in § 6.1.3 above. It need not be the same as the substratum.

6.1.6 The applied stress level is at the discretion of the designer, testing organization and manufacturer. Unless stated otherwise, the orientation shall be normal to the test specimen.

6.1.7 The duration of the loading shall be for 100 hours. A single site-specific data point is obtained at that time, i.e., it is not necessary to perform intermediate flow rate testing, unless otherwise specified by the various parties involved.

6.1.8 The hydraulic gradient at which the above data point is taken (or a range of hydraulic gradients) is at the discretion of the designer, testing organization and manufacturer.

6.1.9 The permeating liquid is to be tap water, unless agreed upon otherwise by the designer, testing organization, and manufacturer.

6.1.10 Calculations

$$Q = kiA \tag{3}$$

$$Q = ki(Wt)$$

$$Q/W = \theta i \tag{4}$$

$$q = \theta i \tag{5}$$

where

Q	= flow rate per unit time (m^3/sec)
k	= permeability (m/sec)
i	= hydraulic gradient (= H/L)
H	= head loss across specimen (m)
L	= length of specimen (m)
A	= cross sectional area of specimen (m^2)
W	= width of specimen (m)
t	= thickness of specimen (m)
θ	= transmissivity (m^3/sec-m or m^2/sec)
q	= flow rate per unit width (m^2/sec)

The results can be presented as flow rate per unit width (Q/W), or as transmissivity (θ), as agreed upon by the parties involved.

7. Reduction Factor for Creep

7.1 Using the GRI GS4 test method or ASTM D6364 (mod.) for time dependent (creep) deformation, the candidate drainage core is placed under compressive stress and its decrease in thickness (deformation) is monitored over time.

> Note 4: This is not a flow rate test, although the test specimen can be immersed in a liquid to be agreed upon by the designer, testing organization, and manufacturer. However, it is usually a test conducted without liquid.

7.1.1 The test specimen shall be the drainage core only. If geotextiles are bonded to the drainage core they should be carefully removed. Alternatively, a sample of the drainage core can be obtained from the manufacturer before the geotextiles are attached. A minimum of three replicate tests shall be performed and the results averaged for the reported value.

7.1.2 Specimen size should be 150 × 150 mm (6.0 × 6.0 in.) and placed in a rigid box made from a steel base and sides. The steel load plate above the test specimen shall be used to transmit a constant stress over time. Deformation of the upper plate is measured by at least two dial gauges and the results averaged accordingly.

> Note 5: For high stress conditions requiring a large size and number of weights with respect to laboratory testing and safety, the specimen size can be reduced to 100 × 100 mm (4.0 × 4.0 in.).

7.1.3 Specimen substratum and superstratum shall be rigid platens. Alternatively, a 1.5 mm (60 mil) thick HDPE geomembrane can be placed against the drainage core with the steel plates as back-ups.

7.1.4 The test specimen shall be dry unless water or a simulated or site-specific leachate is agreed upon by the parties involved.

7.1.5 The normal stress magnitude(s) shall be the same as applied in the transmissivity test described in Section 6.0. Alternatively, it can be as agreed upon by the designer, testing organization, and manufacturer.

7.1.6 The load inclination shall be normal to the test specimen. If there exists a tendency for the core structure to deform laterally, separate tests at the agreed upon load inclinations shall also be performed at the discretion of the parties involved.

7.1.7 The dwell time shall be 10,000 hours. If, however, this is a confirmation test (or if a substantial data base exists on similar products of the same type), the dwell time can be reduced to 1000 hours. This decision must be made with agreement between the designer, testing organization, and manufacturer.

> Note 6: Alternative procedures to arrive at an acceptable value for the creep reduction factor based on shorter test times (e.g., the use of time-temperature superposition or stepped isothermal method) may be acceptable if agreed upon by the various parties involved.

7.1.8 The above process results in a set of creep curves similar to Figure 1(a). The curves are to be interpreted as shown in Figure 1(b). The reduction factor for creep of the core is interpreted according to the following formulas, after Giroud, Zhao and Richardson (2000).

$$RF_{CR} = \left[\frac{\left(t_{CO} / t_{original}\right) - \left(1 - n_{original}\right)}{\left(t_{CR} / t_{original}\right) - \left(1 - n_{original}\right)}\right]^3 \qquad (6)$$

where

RF_{CR}	=	reduction factor for creep
$t_{original}$	=	original thickness (m)
t_{CO}	=	thickness at 100-hours (m)
t_{CR}	=	thickness at >>100-hours, e.g., at 10,000 hours (m)
$n_{original}$	=	original porosity (see Equation 7)

$$n_{original} = 1 - \frac{\mu}{\rho t_{original}} \tag{7}$$

where

μ	=	mass per unit area (kg/m^2)
ρ	=	density of the formulation (kg/m^3)

7.1.9 The above illustrated numeric procedure is not applicable to drainage geocomposites which include geotextiles. It is for the drainage core only.

Example: A HDPE geonet has the following properties: mass per unit area μ = 1216 g/m^2 (or 1.216 kg/m^2); density ρ = 950 kg/m^2 and original thickness of 8.55 mm.

Test specimens were evaluated according to ASTM D4716 for 100 hours and the average thickness decreased to 7.14 mm. A 10,000 hour creep test was then performed on a representative specimen according to GRI-GS4 and the resulting thickness further decreased to 6.30 mm. Thus Δy in Figure 1(b) is 7.14 – 6.30 = 0.84 mm. Determine the creep reduction factor "RF_{CR}".

Solution: The porosity n, is calculated according to Eq. (7) as follows

$$\begin{aligned} n_{original} &= 1 - \frac{\mu}{\rho t_{original}} \\ &= 1 - \frac{1.216}{(950)(0.00855)} \\ &= 1 - 0.150 \\ n_{original} &= 0.850 \end{aligned}$$

The reduction factor for creep is calculated according to Eq. (6) as follows:

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$$RF_{CR} = \left[\frac{(t_{CO} / t_{original}) - (1 - n_{original})}{(t_{CR} / t_{original}) - (1 - n_{original})} \right]^3$$

$$= \left[\frac{(7.14 / 8.55) - (1 - 0.850)}{(6.30 / 8.55) - (1 - 0.850)} \right]^3$$

$$= \left[\frac{0.835 - 0.150}{0.737 - 0.150} \right]^3$$

$$= \left[\frac{0.685}{0.587} \right]^3$$

$$RF_{CR} = 1.59$$

Note 7: Other calculation methods to arrive at the above numeric value of creep reduction factor may be considered if agreed upon by the various parties involved.

8. Reduction Factors for Core Clogging

There are two general types of core clogging that might occur over a long time period. They are chemical clogging and biological clogging. Both are site-specific and both are essentially impractical to simulate in the laboratory.

8.1 Chemical clogging within the drainage core space can occur with precipitates deposited from high alkalinity soils, typically calcium and magnesium. Other precipitates can also be envisioned such as fines from turbid liquids although this is less likely since the turbid liquid must typically pass through a geotextile filter. It is obviously a site-specific situation.

8.2 Biological clogging within the drainage core space can occur by the growth of biological organisms or by roots growing through the overlying soil and extending downward, through the geotextile filter, and into the drainage core. It is a site-specific situation and depends on the local, or anticipated, vegetation, cover soil, hydrology, etc.

8.3 Default tables for the above two potential clogging mechanisms (chemical and biological) are very subjective and by necessity broad in their upper and lower limits. The following table is offered as a guide.

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Range of Clogging Reduction Factors (modified from Koerner, 1998)

Application	Chemical Clogging (RF_{CC})	Biological Clogging (RF_{BC})
Sport fields	1.0 to 1.2	1.1 to 1.3
Capillary breaks	1.0 to 1.2	1.1 to 1.3
Roof and plaza decks	1.0 to 1.2	1.1 to 1.3
Retaining walls, seeping rock and soil slopes	1.1 to 1.5	1.0 to 1.2
Drainage blankets	1.0 to 1.2	1.0 to 1.2
Landfill caps	1.0 to 1.2	1.2 to 3.5
Landfill leak detection	1.1 to 1.5	1.1 to 1.3
Landfill leachate collection	1.5 to 2.0	1.1 to 1.3

Calc Sheet 7

Calc Sheets 5 and 6

9. Polymer Degradation

9.1 Degradation of the materials from which the drainage geocomposite are made, with respect to the site-specific liquid being transmitted, is a polymer issue. Most geocomposite drainage cores are made from polyethylene, polypropylene, polyamide or polystyrene. Most geotextile filter/separators covering the drainage cores are made from polypropylene, polyester or polyethylene.

Note 8: It is completely inappropriate to strip the factory bonded geotextile off of the drainage core and then test one or the other component. The properties of both the geotextile and drainage core will be altered in the lamination process from their original values.

9.2 If polymer degradation testing is recommended, the drainage core and the geotextile should be tested separately in their as-received condition before lamination and bonding.

9.3 The incubation of the drainage cores and/or geotextile coupons is to be done according to the ASTM D5322 immersion procedure.

9.4 The testing of the incubated drainage cores is to be done according to ASTM D6388 which stipulates various test methods for evaluation of incubated geonets.

Note 9: For drainage cores other than geonets, e.g., columnar, cuspated, meshes, etc., it may be necessary to conduct additional tests than appear in ASTM D6388. These tests, and their procedures, should be discussed and agreed upon by the project designer, testing organization, and manufacturer.

9.5 The testing of the incubated geotextiles is to be done according to ASTM D6389 which stipulates various test methods for evaluation of incubated geotextiles.

Note 10: The information obtained in testing the drainage core (Section 9.4) and the geotextile (Section 9.5) result in a "go-no go" situation and not in a reduction factor, per se. If an adverse chemical reaction is indicated, one must select a different type of geocomposite material (drainage core and/or geotextile).

10. Summary

10.1 For a candidate drainage geocomposite, the 100-hour flow rate behavior under the site-specific set of variables, e.g., specimen orientation, stress level, hydraulic gradient, and permeating liquid is to be obtained per ASTM D4716 following procedures of Section 6.0.

10.2 A reduction factor for long term creep of the drainage core following Section 7.0 per GRI GS4 or ASTM D6364 (mod.) is then obtained. The result is usually a unique value for a given set of conditions.

10.3 A reduction factor for chemical and/or biological clogging, as discussed in Section 8.0 can be included. It is very much a site-specific situation at the discretion of the parties involved.

10.4 Polymer degradation to aggressive liquids is covered in separate immersion and test protocols, e.g., ASTM D5322 (immersion), ASTM D6388 (geonets) and ASTM D6389 (geotextiles) as discussed in Section 9.0. The procedure does not result in a reduction factor, rather in a "go-no go" decision with the product under consideration.

10.5 Other possible flow rate reductions and/or concerns such as flow in overlap regions, effect of high or low temperatures, etc., are site-specific and cannot readily be generalized in a guide such as this.

A Hachment 3
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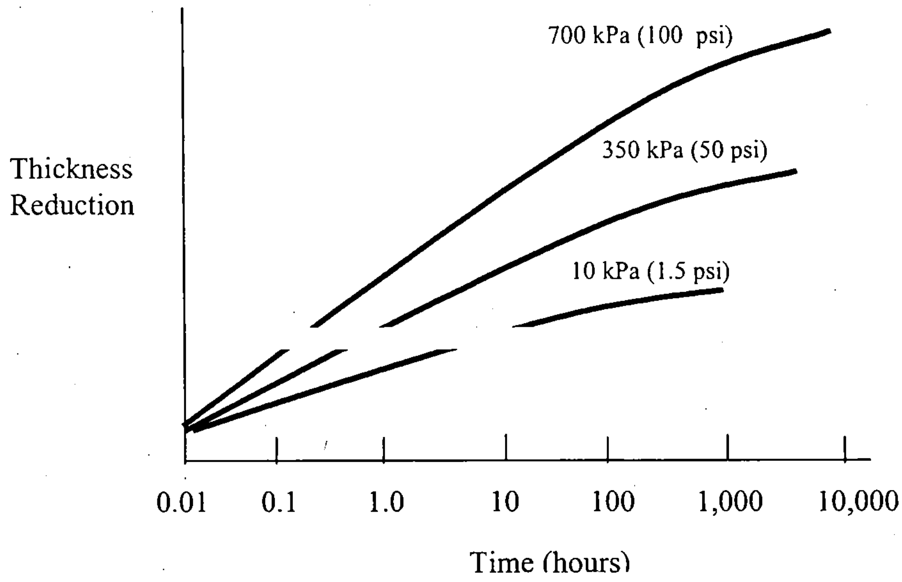
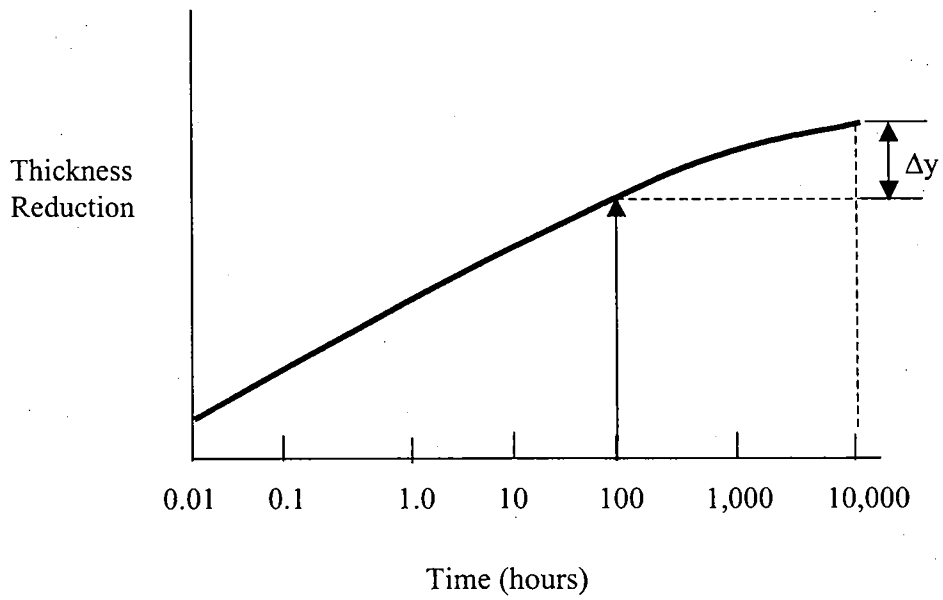


(a) Hypothetical data from creep testing illustrating effect of normal load magnitude



(b) Interpretation of project specific normal load curve to obtain creep reduction factor

Figure 1 – Hypothetical example of creep test data and data interpretation to obtain creep reduction factor

Attachment 4
GSE Creep Info
1/3

Lindsey Kennelly

From: Dhani Narejo [dnarejo@gseworld.com]
ent: Tuesday, August 12, 2003 11:14 AM
'o: Lindsey Kennelly
Subject: RE:

GC8_Final.doc

Creep Reduction Factors for GS...

Let me know if you want a fax instead.

-----Original Message-----
From: Lindsey Kennelly [mailto:lkennelly@scsengineers.com]
Sent: Tuesday, August 12, 2003 9:41 AM
To: Dhani Narejo
Subject:

Dhani

Can you please send it one more time, I get a winmail.dat attachment. Hopefully the plain text email will help. Sorry for the inconvenience.

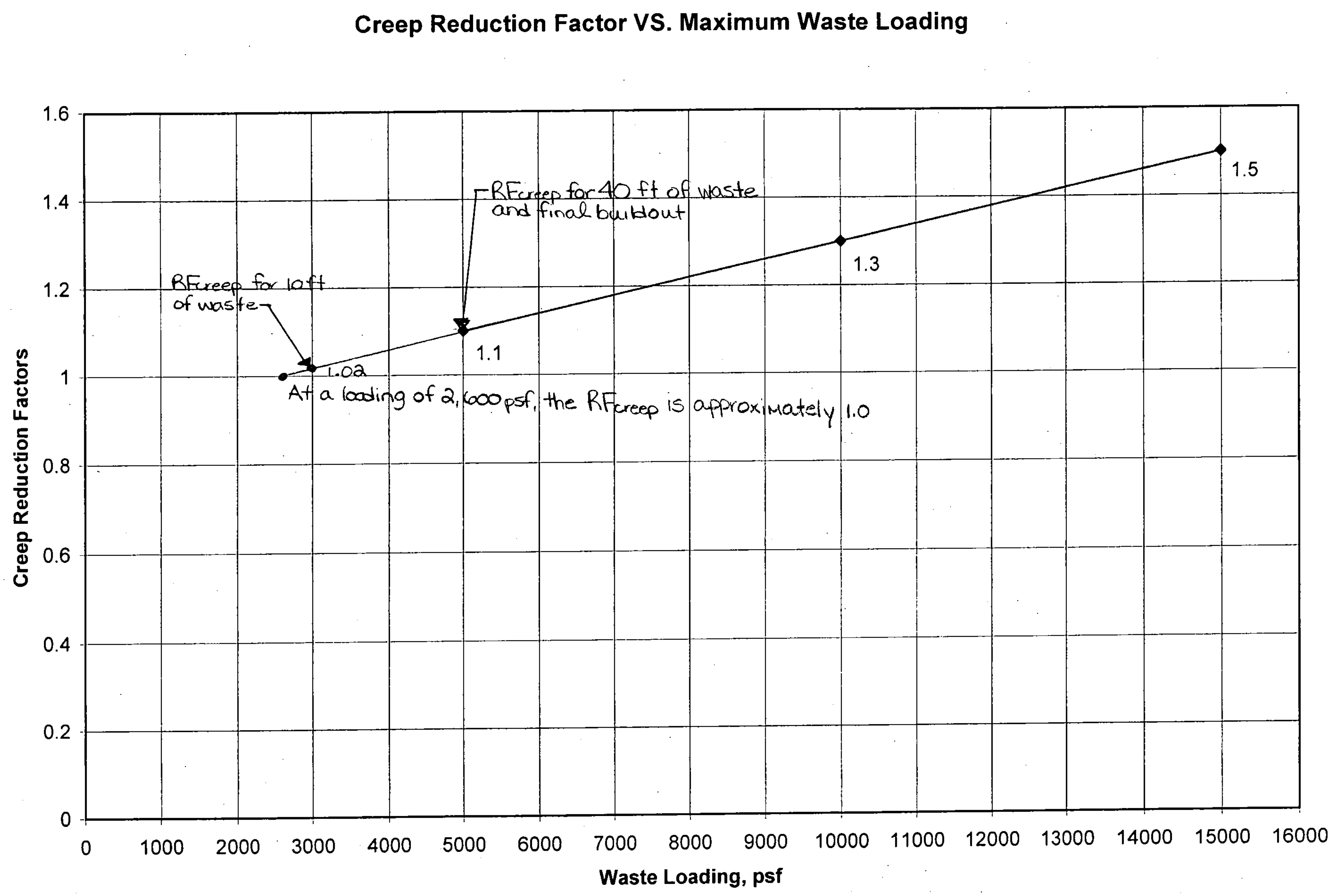
Lindsey Kennelly
SCS ENGINEERS
3012 U.S. Hwy. 301 North
Suite 700
Tampa, FL 33619
lkennelly@scsengineers.com
'813)621-0080
(813)623-6757 (fax)

Dhani Narejo
dnarejo@gseworld.com
800-435-2008

Attachment 4
GSE Creep Info
2/3

Creep Reduction Factors for GSE Geonets

Stress (psf)	Creep Reduction Factor
5,000	1.1
10,000	1.3
15,000	1.5



Attachment 4
GSE Creep Info
3/3

Attachment 5
Terax Creep Data
1/1

SCS TELEPHONE CONVERSATION RECORD

Job No: 09199033.09 **Date:** 12/3/03 **SCS Personnel: Lindsey Kennelly**

Person (called, calling): JP Kline **Time:** 2 pm

Representing: Tenax

Subject: Creep Factors for Triplanar Geocomposite **Tel. #:** (412)371-2973

Items Discussed:

Tenax

Any load less than 25,000 psf will have a creep reduction factor of 1.20

ATTACHMENT H-6

HELP MODEL CALCULATIONS

File No. 09199033.09

MEMORANDUM

SUBJECT: HELP Model Results, Hardee County Landfill Expansion
Hardee County, Florida

Table of Contents

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion – RAI 1	09199033.09

SUBJECT	BY	DATE
Transmissivity Summary	LEK	11/9/04
	CHECKED SHO	DATE 11/15/04

The transmissivity calculations included in the original submittal dated April 8, 2004 calculates values for the open cell, 10 foot waste lift, 40 foot waste lift, and 69.5 foot waste lift. The original calculations used the following transmissivity and hydraulic conductivity values for each of the scenarios:

Scenario	Transmissivity (cm^2/s)		Hydraulic Conductivity (cm/s)	
	Biplanar	Triplanar	Biplanar	Triplanar
Open Cell	13.5	20	17.7	26.2
10 Foot Waste Lift	5.1	8.5	6.8*	13.4*
40 Foot Waste Lift	4.7	8.5	6.8*	13.4*
69.5 Foot Waste Lift	4.7	8.5	6.8*	13.4*

* Represents long term hydraulic conductivity and accounts for biological clogging, chemical clogging, intrusion, and creep of the geocomposite.

A reduced hydraulic conductivity was used in the 10 foot waste lift scenario by accounting for full biological and chemical clogging and a creep factor of 1.02. In all actuality, with only 10 feet of waste within the cell, it is highly unlikely that full biological and chemical clogging would occur. In order to be more accurate, a weighted ratio was taken in order to determine a revised hydraulic conductivity value for the 10 foot waste lift run.

Scenario	Hydraulic Conductivity (cm/s)	
	Biplanar	Triplanar
10 Foot Waste Lift	14.1	21.9

The HELP model has been revised to reflect these changes in the hydraulic conductivity.

See Sheet 2 of this Attachment for the calculations.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

SCS ENGINEERS

SHEET 2 OF

CLIENT Hardee County	PROJECT Landfill Expansion		JOB NUMBER 09199033.09
SUBJECT Transmissivity Calculations		BY LEK	DATE 11/9/04
		CHECKED THG	DATE 11/15/04

The transmissivity calculations in Attachment H-5 of the Solid Waste Permit Application are very conservative.

Determine the transmissivity & hydraulic conductivity of a lift of waste that is 10ft deep.

	Biplanar	Triplanar
Open Cell	$17.7 \frac{cm}{s}$	$26.2 \frac{cm}{s}$
40 ft Lift	$6.8 \frac{cm}{s}$	$13.4 \frac{cm}{s}$

10ft Lift:

Biplanar $17.7 \frac{cm}{s} - 6.8 \frac{cm}{s} = 10.9 \frac{cm}{s} = \Delta T$

$40ft - 10ft = 30 ft$

$\therefore$ In 30 ft of waste, $10.9 \frac{cm}{s}$ difference in T

$\frac{10.9 \frac{cm}{s}}{30ft} \sim \frac{X}{10ft}$ $X = 3.6 \frac{cm}{s}$ in 10 ft

@ 10ft, $T = 17.7 \frac{cm}{s} - 3.6 \frac{cm}{s} = 14.1 \frac{cm}{s}$ for Biplanar

Triplanar $26.2 \frac{cm}{s} - 13.4 \frac{cm}{s} = 12.8 \frac{cm}{s} = \Delta T$

$\therefore$ In 30 ft of waste, $12.8 \frac{cm}{s}$ difference in T

$\frac{12.8 \frac{cm}{s}}{30ft} \sim \frac{X}{10ft}$ $X = 4.3 \frac{cm}{s}$ in 10 ft

@ 10 ft, $T = 26.2 \frac{cm}{s} - 4.3 \frac{cm}{s} = 21.9 \frac{cm}{s}$ in 10 ft for triplanar

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

SCS ENGINEERS

SHEET 3 of

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT	BY: LEK REVISED: LEK	DATE: 2/11/2004 11/9/2004	
HELP Model Summary Peak Daily Values	CHECKED SHO	DATE 11/15/04	

Case 1, Waste Depth = 0 feet

	Collection System, k = 17.7 cm/s					Detection System, k = 26.2 cm/s			
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Leachate Collected (gal/day)	Leachate Collected (cf/s)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Leachate Collected (gal/day)
Length = 45.6 ft Slope = 2.19%	0.110	10,012	52.01	74,890	166.867	0.000	29	0.15	217
Length = 67.0 ft Slope = 3.13%	0.115	9,997	51.93	74,778	166.617	0.000	29	0.15	217
Length = 63.7 ft Slope =2.81%	0.119	9,784	50.82	73,184	163.067	0.000	30	0.16	224

Case 2 - Waste Depth = 10 feet

	Collection System, k = 6.8 cm/s					Detection System, k = 13.4 cm/s			
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Leachate Collected (gal/day)	Leachate Collected (cf/s)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Leachate Collected (gal/day)
Length = 47.2 ft Slope = 2.02%	0.102	6,571	34.13	49,151	109.517	0.000	30	0.16	217
Length = 77.3 ft Slope = 2.14%	0.161	6,678	34.69	49,951	111.300	0.001	38	0.20	217

Case 3 - Waste Depth = 40 feet

	Collection System, k = 6.8 cm/s					Detection System, k = 13.4 cm/s			
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Leachate Collected (gal/day)	Leachate Collected (cf/s)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Leachate Collected (gal/day)
Length = 77.3 ft Slope = 2.14%	0.144	2,868	14.90	21,453	47.800	0.003	71	0.37	532

Case 4 - Waste Depth = 69.5 feet

	Collection System, k = 6.8 cm/s					Detection System, k = 13.4 cm/s			
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Leachate Collected (gal/day)	Leachate Collected (cf/s)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Leachate Collected (gal/day
Length = 77.3 ft Slope = 2.14%	0.130	2,582	13.41	19,313	43.033	0.001	34	0.18	254

Note: All flowrates are based on a per acre basis.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

SCS ENGINEERS

SHEET 4 of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK	DATE: 2/11/2004
HELP Model Summary	REVISED: LEK	11/9/2004
Annual Average Values	CHECKED SRO	DATE 11/15/04

Case 1, Waste Depth = 0 feet

	Collection System, k = 17.7 cm/s					Detection System, k = 26.2 cm/s			
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Leachate Collected (gal/day)	Leachate Collected (cf/s)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Leachate Collected (gal/day)
Length = 45.6 ft Slope = 2.19%	0.001	77,435	1.10	1,587	0.002	0.000	1,264	0.02	26
Length = 67.0 ft Slope = 3.13%	0.001	77,149	1.10	1,581	0.002	0.000	1,278	0.02	26
Length = 63.7 ft Slope =2.81%	0.001	76,754	1.09	1,573	0.002	0.000	1,310	0.02	27

Case 2 - Waste Depth = 10 feet

	Collection System, k = 6.8 cm/s					Detection System, k = 13.4 cm/s			
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Leachate Collected (gal/day)	Leachate Collected (cf/s)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Leachate Collected (gal/day)
Length = 47.2 ft Slope = 2.02%	0.002	73,445	1.05	1,505	3.354	0.000	1,504	0.02	31
Length = 77.3 ft Slope = 2.14%	0.002	70,693	1.01	1,449	3.228	0.000	1,821	0.03	37

Case 3 - Waste Depth = 40 feet

	Collection System, k = 6.8 cm/s					Detection System, k = 13.4 cm/s			
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Leachate Collected (gal/day)	Leachate Collected (cf/s)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Leachate Collected (gal/day)
Length = 77.3 ft Slope = 2.14%	0.005	65,438	0.93	1,341	2.988	0.001	4,958	0.07	102

Case 4 - Waste Depth = 69.5 feet

	Collection System, k = 6.8 cm/s					Detection System, k = 13.4 cm/s			
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Leachate Collected (gal/day)	Leachate Collected (cf/s)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Leachate Collected (gal/day)
Length = 77.3 ft Slope = 2.14%	0.008	107,302	1.53	2,199	4.900	0.000	3,395	0.05	70

Note: All flowrates are based on a per acre basis.

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
DISTRICT
TAMPA

HARDEE COUNTY LANDFILL
HARDEE COUNTY, FLORIDA
MONTHLY RAINFALL DATA 1990-2003

Month	Rainfall (inch)
Jan-90	0.14
Feb-90	4.96
Mar-90	0.68
Apr-90	2.71
May-90	2.05
Jun-90	5.34
Jul-90	10.76
Aug-90	10.8
Sep-90	5.65
Oct-90	1.43
Nov-90	0.45
Dec-90	1.03
1990 Total:	46.00

Month	Rainfall (inch)
Jan-91	2.59
Feb-91	1.31
Mar-91	4.35
Apr-91	4.18
May-91	4.05
Jun-91	12.94
Jul-91	10.25
Aug-91	7.37
Sep-91	2.21
Oct-91	3.47
Nov-91	0.12
Dec-91	0.28
1991 Total:	53.12

Month	Rainfall (inch)
Jan-92	0.3
Feb-92	5.21
Mar-92	2.07
Apr-92	6.44
May-92	1.61
Jun-92	12.75
Jul-92	2.91
Aug-92	12.76
Sep-92	4.95
Oct-92	2.95
Nov-92	1.55
Dec-92	0.69
1992 Total:	54.19

Month	Rainfall (inch)
Jan-93	5.93
Feb-93	2.15
Mar-93	5.52
Apr-93	4.34
May-93	2.42
Jun-93	7.62
Jul-93	7.47
Aug-93	6.24
Sep-93	5.23
Oct-93	5.16
Nov-93	0.72
Dec-93	1.27
1993 Total:	54.07

Month	Rainfall (inch)
Jan-94	3.2
Feb-94	1.58
Mar-94	3.34
Apr-94	1.45
May-94	2.71
Jun-94	13.04
Jul-94	7.29
Aug-94	7.44
Sep-94	no data
Oct-94	no data
Nov-94	no data
Dec-94	no data
1994 Total:	40.05

Month	Rainfall (inch)
Jan-95	**no data**
Feb-95	**no data**
Mar-95	**no data**
Apr-95	6.6
May-95	0.65
Jun-95	8.56
Jul-95	11.41
Aug-95	9.99
Sep-95	5.58
Oct-95	8.64
Nov-95	1.45
Dec-95	0.33
1995 Total:	53.21

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 30 2005
SOUTHWEST DISTRICT
TAMPA

Month	Rainfall (inch)
Jan-96	2.67
Feb-96	1.38
Mar-96	3.79
Apr-96	0.76
May-96	4.25
Jun-96	4.24
Jul-96	3.71
Aug-96	8.56
Sep-96	7.83
Oct-96	3.49
Nov-96	0.74
Dec-96	2.51
1996 Total:	43.93

Month	Rainfall (inch)
Jan-97	0.44
Feb-97	0.3
Mar-97	2.6
Apr-97	5.95
May-97	2.85
Jun-97	7.42
Jul-97	12.26
Aug-97	8.66
Sep-97	5.38
Oct-97	3.24
Nov-97	10.38
Dec-97	6.29
1997 Total:	65.77

Month	Rainfall (inch)
Jan-98	6.09
Feb-98	8.82
Mar-98	12.14
Apr-98	2.53
May-98	3.57
Jun-98	1.69
Jul-98	6.78
Aug-98	7.58
Sep-98	10.19
Oct-98	1.76
Nov-98	3.34
Dec-98	1.56
1998 Total:	66.05

Month	Rainfall (inch)
Jan-99	3.73
Feb-99	0.8
Mar-99	0.87
Apr-99	2.65
May-99	2.47
Jun-99	4.08
Jul-99	2.9
Aug-99	7.26
Sep-99	5.5
Oct-99	5.61
Nov-99	2
Dec-99	2.4
1999 Total:	40.27

Month	Rainfall (inch)
Jan-00	0
Feb-00	0
Mar-00	0.85
Apr-00	1.4
May-00	0
Jun-00	3.18
Jul-00	5.8
Aug-00	5.62
Sep-00	10.47
Oct-00	0
Nov-00	0.79
Dec-00	1.45
2000 Total:	29.56

Month	Rainfall (inch)
Jan-01	0
Feb-01	0
Mar-01	6.98
Apr-01	0
May-01	5.37
Jun-01	9.16
Jul-01	13.31
Aug-01	6.15
Sep-01	7.03
Oct-01	0.67
Nov-01	0.8
Dec-01	0
2001 Total:	49.47

Month	Rainfall (inch)
Jan-02	2.02
Feb-02	6.03
Mar-02	0
Apr-02	4.28
May-02	1.77
Jun-02	9.02
Jul-02	7.17
Aug-02	7.24
Sep-02	3.46
Oct-02	4.87
Nov-02	8.46
Dec-02	7.89
2002 Total:	62.21

Month	Rainfall (inch)
Jan-03	1.28
Feb-03	**2.05**
Mar-03	**2.02**
Apr-03	**3.45**
May-03	**5.07**
Jun-03	**11.9**
Jul-03	**4.4**
Aug-03	**12.28**
Sep-03	**no data**
Oct-03	**no data**
Nov-03	**no data**
Dec-03	**no data**
2003 Total:	42.45

Source: NOAA Weather Station - Wachula
Coop ID # 089401

AVERAGE MONTHLY RAINFALL DISTRIBUTION

Month	Rainfall (inch)
Jan	2.18
Feb	2.66
Mar	3.48
Apr	3.34
May	2.77
Jun	7.92
Jul	7.60
Aug	8.43
Sep	6.12
Oct	3.44
Nov	2.57
Dec	2.14
Average:	52.66

Note: Monthly averages do not include months with "No Data' Reported.

Rainfall data submitted with original April 2004 submittal.

This represents the greatest monthly average used in the HELP model.

f:/project/hardee/09199033.09/calcs/rainfalldata.xls

HARDEE COUNTY LANDFILL
HARDEE COUNTY, FLORIDA
MONTHLY RAINFALL DATA 1990-2004

Month	Rainfall (inch)
Jan-90	0.14
Feb-90	4.96
Mar-90	0.68
Apr-90	2.71
May-90	2.05
Jun-90	5.34
Jul-90	10.76
Aug-90	10.8
Sep-90	5.65
Oct-90	1.43
Nov-90	0.45
Dec-90	1.03
1990 Total:	46.00

Month	Rainfall (inch)
Jan-91	2.59
Feb-91	1.31
Mar-91	4.35
Apr-91	4.18
May-91	4.05
Jun-91	12.94
Jul-91	10.25
Aug-91	7.37
Sep-91	2.21
Oct-91	3.47
Nov-91	0.12
Dec-91	0.28
1991 Total:	53.12

Month	Rainfall (inch)
Jan-92	0.3
Feb-92	5.21
Mar-92	2.07
Apr-92	6.44
May-92	1.61
Jun-92	12.75
Jul-92	2.91
Aug-92	12.76
Sep-92	4.95
Oct-92	2.95
Nov-92	1.55
Dec-92	0.69
1992 Total:	54.19

Month	Rainfall (inch)
Jan-93	5.93
Feb-93	2.15
Mar-93	5.52
Apr-93	4.34
May-93	2.42
Jun-93	7.62
Jul-93	7.47
Aug-93	6.24
Sep-93	5.23
Oct-93	5.16
Nov-93	0.72
Dec-93	1.27
1993 Total:	54.07

Month	Rainfall (inch)
Jan-94	3.2
Feb-94	1.58
Mar-94	3.34
Apr-94	1.45
May-94	2.71
Jun-94	13.04
Jul-94	7.29
Aug-94	7.44
Sep-94	no data
Oct-94	no data
Nov-94	no data
Dec-94	no data
1994 Total:	40.05

Month	Rainfall (inch)
Jan-95	**no data**
Feb-95	**no data**
Mar-95	**no data**
Apr-95	6.6
May-95	0.65
Jun-95	8.56
Jul-95	11.41
Aug-95	9.99
Sep-95	5.58
Oct-95	8.64
Nov-95	1.45
Dec-95	0.33
1995 Total:	53.21

Month	Rainfall (inch)
Jan-96	2.67
Feb-96	1.38
Mar-96	3.79
Apr-96	0.76
May-96	4.25
Jun-96	4.24
Jul-96	3.71
Aug-96	8.56
Sep-96	7.83
Oct-96	3.49
Nov-96	0.74
Dec-96	2.51
1996 Total:	43.93

Month	Rainfall (inch)
Jan-97	0.44
Feb-97	0.3
Mar-97	2.6
Apr-97	5.95
May-97	2.85
Jun-97	7.42
Jul-97	12.26
Aug-97	8.66
Sep-97	5.38
Oct-97	3.24
Nov-97	10.38
Dec-97	6.29
1997 Total:	65.77

Month	Rainfall (inch)
Jan-98	6.09
Feb-98	8.82
Mar-98	12.14
Apr-98	2.53
May-98	3.57
Jun-98	1.69
Jul-98	6.78
Aug-98	7.58
Sep-98	10.19
Oct-98	1.76
Nov-98	3.34
Dec-98	1.56
1998 Total:	66.05

Month	Rainfall (inch)
Jan-99	3.73
Feb-99	0.8
Mar-99	0.87
Apr-99	2.65
May-99	2.47
Jun-99	4.08
Jul-99	2.9
Aug-99	7.26
Sep-99	5.5
Oct-99	5.61
Nov-99	2
Dec-99	2.4
1999 Total:	40.27

Month	Rainfall (inch)
Jan-00	0
Feb-00	0
Mar-00	0.85
Apr-00	1.4
May-00	0
Jun-00	3.18
Jul-00	5.8
Aug-00	5.62
Sep-00	10.47
Oct-00	0
Nov-00	0.79
Dec-00	1.45
2000 Total:	29.56

Month	Rainfall (inch)
Jan-01	0
Feb-01	0
Mar-01	6.98
Apr-01	0
May-01	5.37
Jun-01	9.16
Jul-01	13.31
Aug-01	6.15
Sep-01	7.03
Oct-01	0.67
Nov-01	0.8
Dec-01	0
2001 Total:	49.47

Month	Rainfall (inch)
Jan-02	2.02
Feb-02	6.03
Mar-02	0
Apr-02	4.28
May-02	1.77
Jun-02	9.02
Jul-02	7.17
Aug-02	7.24
Sep-02	3.46
Oct-02	4.87
Nov-02	8.46
Dec-02	7.89
2002 Total:	62.21

Month	Rainfall (inch)
Jan-03	1.28
Feb-03	2.05
Mar-03	2.02
Apr-03	3.45
May-03	5.07
Jun-03	11.9
Jul-03	4.4
Aug-03	12.28
Sep-03	4.55
Oct-03	1.27
Nov-03	0.76
Dec-03	2.61
2003 Total:	51.64

Month	Rainfall (inch)
Jan-04	1.94
Feb-04	3.4
Mar-04	0.57
Apr-04	1.13
May-04	0.7
Jun-04	9.92
Jul-04	7.0
Aug-04	--
Sep-04	--
Oct-04	--
Nov-04	--
Dec-04	--
2004 Total:	24.66

AVERAGE MONTHLY RAINFALL DISTRIBUTION

Month	Rainfall (inch)
Jan	2.17
Feb	2.71
Mar	3.27
Apr	3.19
May	2.64
Jun	8.06
Jul	7.56
Aug	8.43
Sep	6.00
Oct	3.27
Nov	2.43
Dec	2.18
Average:	51.90

Rainfall data submitted with May 20, 2005 submittal

Source: NOAA Weather Station - Wachula
Coop ID # 089401

Note:
Monthly averages do not include months with "No Data' Reported.

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 30 2005
SOUTHWEST DISTRICT
TAMPA

f:/project/hardee/09199033.09/calcs/rainfalldata-revised.xls

HARDEE COUNTY LANDFILL
HARDEE COUNTY, FLORIDA
MONTHLY RAINFALL DATA 1990-2005

Month	Rainfall (inch)
Jan-90	0.14
Feb-90	4.96
Mar-90	0.68
Apr-90	2.71
May-90	2.05
Jun-90	5.34
Jul-90	10.76
Aug-90	10.80
Sep-90	5.65
Oct-90	1.43
Nov-90	0.45
Dec-90	1.03
1990 Total:	46.00

Month	Rainfall (inch)
Jan-91	2.59
Feb-91	1.31
Mar-91	4.35
Apr-91	4.18
May-91	4.05
Jun-91	12.94
Jul-91	10.25
Aug-91	7.37
Sep-91	2.21
Oct-91	3.47
Nov-91	0.12
Dec-91	0.28
1991 Total:	53.12

Month	Rainfall (inch)
Jan-92	0.30
Feb-92	5.21
Mar-92	2.07
Apr-92	6.44
May-92	1.61
Jun-92	12.75
Jul-92	2.91
Aug-92	12.76
Sep-92	4.95
Oct-92	2.95
Nov-92	1.55
Dec-92	0.69
1992 Total:	54.19

Month	Rainfall (inch)
Jan-93	5.93
Feb-93	2.15
Mar-93	5.52
Apr-93	4.34
May-93	2.42
Jun-93	7.62
Jul-93	7.47
Aug-93	6.24
Sep-93	5.23
Oct-93	5.16
Nov-93	0.72
Dec-93	1.27
1993 Total:	54.07

Month	Rainfall (inch)
Jan-94	3.20
Feb-94	1.58
Mar-94	3.34
Apr-94	1.45
May-94	2.71
Jun-94	13.04
Jul-94	7.29
Aug-94	7.44
Sep-94	no data
Oct-94	no data
Nov-94	no data
Dec-94	no data
1994 Total:	40.05

Month	Rainfall (inch)
Jan-95	**no data**
Feb-95	**no data**
Mar-95	**no data**
Apr-95	6.60
May-95	0.65
Jun-95	8.56
Jul-95	11.41
Aug-95	9.99
Sep-95	5.58
Oct-95	8.64
Nov-95	1.45
Dec-95	0.33
1995 Total:	53.21

Month	Rainfall (inch)
Jan-96	2.67
Feb-96	1.38
Mar-96	3.79
Apr-96	0.76
May-96	4.25
Jun-96	4.24
Jul-96	3.71
Aug-96	8.56
Sep-96	7.83
Oct-96	3.49
Nov-96	0.74
Dec-96	2.51
1996 Total:	43.93

Month	Rainfall (inch)
Jan-97	0.44
Feb-97	0.30
Mar-97	2.60
Apr-97	5.95
May-97	2.85
Jun-97	7.42
Jul-97	12.26
Aug-97	8.66
Sep-97	5.38
Oct-97	3.24
Nov-97	10.38
Dec-97	6.29
1997 Total:	65.77

Month	Rainfall (inch)
Jan-98	6.09
Feb-98	8.82
Mar-98	12.14
Apr-98	2.53
May-98	3.57
Jun-98	1.69
Jul-98	6.78
Aug-98	7.58
Sep-98	10.19
Oct-98	1.76
Nov-98	3.34
Dec-98	1.56
1998 Total:	66.05

Month	Rainfall (inch)
Jan-99	3.73
Feb-99	0.80
Mar-99	0.87
Apr-99	2.65
May-99	2.47
Jun-99	4.08
Jul-99	2.90
Aug-99	7.26
Sep-99	5.50
Oct-99	5.61
Nov-99	2.00
Dec-99	2.40
1999 Total:	40.27

Month	Rainfall (inch)
Jan-00	0.00
Feb-00	0.00
Mar-00	0.85
Apr-00	1.40
May-00	0.00
Jun-00	3.18
Jul-00	5.80
Aug-00	5.62
Sep-00	10.47
Oct-00	0.00
Nov-00	0.79
Dec-00	1.45
2000 Total:	29.56

Month	Rainfall (inch)
Jan-01	0.00
Feb-01	0.00
Mar-01	6.98
Apr-01	0.00
May-01	5.37
Jun-01	9.16
Jul-01	13.31
Aug-01	6.15
Sep-01	7.03
Oct-01	0.67
Nov-01	0.80
Dec-01	0.00
2001 Total:	49.47

Month	Rainfall (inch)
Jan-02	2.02
Feb-02	6.03
Mar-02	0.00
Apr-02	4.28
May-02	1.77
Jun-02	9.02
Jul-02	7.17
Aug-02	7.24
Sep-02	3.46
Oct-02	4.87
Nov-02	8.46
Dec-02	7.89
2002 Total:	62.21

Month	Rainfall (inch)
Jan-03	1.28
Feb-03	2.05
Mar-03	2.02
Apr-03	3.45
May-03	5.07
Jun-03	11.90
Jul-03	4.40
Aug-03	12.28
Sep-03	4.55
Oct-03	1.27
Nov-03	0.76
Dec-03	2.61
2003 Total:	51.64

Month	Rainfall (inch)
Jan-04	1.94
Feb-04	3.40
Mar-04	0.57
Apr-04	1.13
May-04	0.70
Jun-04	9.64
Jul-04	6.42
Aug-04	8.73
Sep-04	6.37
Oct-04	1.44
Nov-04	0.73
Dec-04	0.65
2004 Total:	41.72

Month	Rainfall (inch)
Jan-05	2.15
Feb-05	2.60
Mar-05	3.09
Apr-05	3.58
May-05	2.80
Jun-05	16.20
Jul-05	9.46
Aug-05	4.22
Sep-05	
Oct-05	
Nov-05	
Dec-05	
2005 Total:	44.10

AVERAGE MONTHLY RAINFALL DISTRIBUTION

Month	Rainfall (inch)
Jan	2.17
Feb	2.71
Mar	3.26
Apr	3.22
May	2.65
Jun	8.55
Jul	7.64
Aug	8.18
Sep	6.03
Oct	3.14
Nov	2.31
Dec	2.18
Average:	49.71

Rainfall data submitted with this submittal. See backup data in following pages.

Source: NOAA Weather Station - Wachula
Coop ID # 089401

Note:
The data for August 2004 was obtained from the University of Florida Research Center in Ulna, Florida.

FLORIDA DEPARTMENT
ENVIRONMENTAL
NOV 30 2005
SOUTHWEST DI
TAMPA

f:/project/hardee/09199033.09/calcs/rainfalldata-revised2005.xls

August 2004

Campbell Scientific LoggerNet Processed Daily Outputs

Month Day	Avg Air TempF	Max Air TempF	Min Air TempF	Avg Slr W/m2	Poten ET	MaxWS (mph)	AvgWS (mph)	Total Rain (in)	Max STemp F	Min STemp F
8 1	78.40	91.10	73.50	0.21	0.109	20.0	2.0	0.02	95.10	71.30
8 2	78.00	88.00	74.70	0.14	0.067	19.9	2.9	0.13	91.70	73.00
8 3	78.90	84.20	74.70	0.18	0.078	15.2	4.1	0.13	86.00	73.50
8 4	78.40	85.60	74.50	0.17	0.075	15.8	2.7	0.24	87.70	72.40
8 5	77.50	84.40	73.80	0.11	0.043	16.7	1.8	0.52	86.20	72.70
8 6	80.50	89.60	74.90	0.23	0.119	15.3	3.1	0.04	91.10	73.60
8 7	82.30	90.60	77.20	0.25	0.135	14.7	3.1	0.00	92.00	75.60
8 8	78.10	88.40	74.90	0.16	0.073	12.5	2.1	0.55	92.40	73.80
8 9	78.40	84.70	73.80	0.11	0.045	12.6	1.1	0.07	86.40	71.60
8 10	78.60	92.20	73.00	0.23	0.107	15.2	1.0	0.00	95.50	71.20
8 11	81.70	93.80	73.20	0.28	0.122	9.3	0.8	0.00	97.80	71.00
8 12	79.80	93.20	72.90	0.22	0.108	14.5	1.7	0.03	95.50	71.30
8 13	81.10	90.70	71.80	0.23	0.127	19.5	3.1	0.55	93.00	70.70
8 14	83.60	*87.00	72.80	0.09	0.034	58.6	5.9	4.19	84.60	72.10
8 15	76.40	90.00	71.90	0.17	0.059	18.2	1.1	0.94	89.10	70.90
8 16	78.80	92.60	72.40	0.25	0.112	27.6	1.2	0.00	96.10	71.20
8 17	79.80	93.30	72.70	0.22	0.073	14.3	0.5	0.53	95.60	71.20
8 18	-6999	94.10	*72.00	0.23	0.074	18.9	0.6	3.62	97.60	71.20
8 19	-6999	*93.00	*73.00	0.24	6999	22.7	1.5	2.64	97.80	82.30
8 20	-6999	*93.00	*74.00	0.24	0.064	26.6	0.8	0.77	111.3	91.30
8 21	90.90	*93.00	*74.00	0.24	0.118	9.8	0.7	0.09	132.5	103.1
8 22	82.60	95.60	75.90	0.22	0.083	14.8	0.4	0.10	131.1	84.50
8 23	79.90	94.40	73.70	0.25	0.081	17.8	1.7	0.01	111.5	73.90
8 24	79.00	90.00	74.90	0.18	0.083	13.2	1.3	0.20	104	76.50
8 25	78.50	87.60	73.80	0.16	0.063	12.8	1.0	0.00	103.5	74.30
8 26	80.20	90.60	73.10	0.25	0.127	10.5	1.8	0.00	103.7	72.50
8 27	80.30	92.60	73.90	0.21	0.090	15.2	1.1	0.04	100.2	73.30
8 28	78.60	92.40	71.00	0.20	0.069	16.7	1.2	0.00	96.60	69.60
8 29	81.60	91.80	73.80	0.27	0.144	12.8	1.6	0.00	94.40	71.40
8 30	81.70	91.80	73.90	0.28	0.150	13.5	2.0	0.00	94.40	71.70
8 31	79.40	93.10	73.40	0.20	0.084	24.7	0.7	0.69	95.50	71.30
AVG		90.73	73.65				Total	16.10"		

* FAWN

Source: UF Research Center
Ona, FL

	High	Low
MAX	95.60	77.20
MIN	84.20	71.00

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 30 2005
SOUTHWEST DISTRICT
TAMPA

STATION (Climatological)	(River Station, if different)	MONTH	
Wauchula Waste Water Plant		June	2004

STATE	COUNTY	RIVER
Fl.	Hardee	

TIME (local) OF OBSERVATION RIVER	TEMP.	PRECIPITATION	STANDARD TIME IN USE
700			EST

TYPE OF RIVER GAGE	ELEVATION OF RIVER GAGE ZERO Ft.	FLOOD STAGE Ft.	NORMAL POOL STAGE Ft.

WS FORM B-91
(12-93)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

TEMPERATURE F. — 24 HRS. ENDING AT OBSERVATION
PRECIPITATION — Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M.
WEATHER (Calendar Day) — Mark 'X' for all types occurring each day.

DATE	MAX.	MIN.	AT OBSN.	Rain, melted snow, etc. (ins. and hundredths)	Snow, ice pellets (ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (ins.)	Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.,)
1	97	67	68														
2	98	68	70														
3	97	67	67	1.18													
4	95	67	67														
5	94	66	66														
6	92	66	67														
7	93	66	67														
8	92	67	69	.17													
9	90	68	71	.67													
10	92	70	71	.54													
11	93	69	69	.85													
12	92	64	72	.17													
13	93	71	71	.84													
14	92	72	72														
15	92	71	72	.18													
16	90	72	73	.88													
17	91	70	71														
18	90	71	74														
19	91	73	73														
20	94	72	73														
21	93	72	72	.05													
22	92	71	71														
23	94	69	69														
24	98	69	70														
25	94	71	71	.45													
26	96	71	72	.20													
27	94	72	72														
28	92	68	71	2.17													
29	88	70	71	1.79													
30	91	69	69														
31				9.64													
SUM			SUM				Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds					

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER

SUPERVISING OFFICE
TAMPA BAY AREA (RUSKIN), FL (TBW)

STATION INDEX NO.
08-9401-04

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 30 2005
SOUTHWEST DISTRICT
TAMPA

WS FORM B-91
(12-93)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATION (Climatological)	(River Station, if different)	MONTH	YEAR
Wauch la Waste Water Plant		July	2004

STATE	COUNTY	RIVER
Fl	Hardee	

TIME (local) OF OBSERVATION RIVER	TEMP.	PRECIPITATION	STANDARD TIME IN USE
700			

TYPE OF RIVER GAGE	ELEVATION OF RIVER GAGE ZERO Ft.	FLOOD STAGE Ft.	NORMAL POOL STAGE Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)	WEATHER (Calendar Day) Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.,)
1	92	69	72														
2	94	69	75	.22													
3	92	71	73														
4	94	71	71														
5	92	72	72	.12													
6	92	71	72	.12													
7	94	70	71														
8	92	68	68														
9	95	68	71														
10	96	68	72														
11	95	71	71														
12	93	69	69	.56													
13	92	69	72														
14	92	72	73														
15	94	73	73														
16	89	74	74	.70													
17	90	71	72														
18	89	71	73														
19	88	71	73	2.37													
20	79	73	74														
21	77	71	71	.85													
22	90	71	73														
23	92	71	71														
24	92	71	72														
25	93	72	72	.18													
26	93	72	72														
27	91	71	72	.31													
28	91	72	72														
29	91	72	73	1.22													
30	89	73	73	.27													
31	91	71	71														
SUM			SUM	6.42													

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~~) through hours precipitation probably occurred unobserved.

A.M. NOON P.M.
1 2 3 4 5 6 7 8 9 10 11 1 2 3 4 5 6 7 8 9 10 11

WEATHER: Mark 'X' for all types occurring each day.

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER

SUPERVISING OFFICE
TAMPA BAY AREA (RUSKIN), FL (TBW)

STATION INDEX NO.
08-9401-04

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 30 2005
SOUTHWEST DISTRICT
TAMPA

Wauchula Waste Water Plant — Aug 2004

WS FORM B-91
(12-93)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATE	COUNTY	RIVER
Fl	Hardee	

TIME (local) OF OBSERVATION RIVER	TEMP.	PRECIPITATION	STANDARD TIME IN USE

TYPE OF RIVER GAGE	ELEVATION OF RIVER GAGE ZERO	FLOOD STAGE	NORMAL POOL STAGE
	Ft.	Ft.	Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (ins. and hundredths)	Snow, ice pellets (ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (ins.)	WEATHER (Calendar Day) Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	91	71	73														
2	87	73	75														
3	87	73	74														
4	87	74	74														
5	86	73	74	1.37													
6	90	74	76	.28													
7	90	73	73														
8	89	75	73	.38													
9	85	74	74	.04													
10	96	72	73	1.78													
11	93	72	73														
12	93	72	73														
13	93	72	73	.68													
14	Hurricane																
15																	
16																	
17																	
18																	
19																	
20																	
21																	
22																	
23																	
24																	
25																	
26																	
27	95	71	73														
28	92	71	89														
29	92	74	74														
30	93	74	74														
31	95	73	73	4.20													
SUM			SUM	8.73			Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds					

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~~) through hours precipitation probably occurred unobserved. A.M. 1 2 3 4 5 6 7 8 9 10 11 NOON P.M. 1 2 3 4 5 6 7 8 9 10 11

WEATHER: Mark 'X' for all types occurring each day.

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage
F. Shore ice.
G. Floating ice.
H. Pool stage.

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

OBSERVER

SUPERVISING OFFICE

TAMPA BAY AREA (RUSKIN), FL (TBW)

STATION INDEX NO. 08-9401-04

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 30 2005
SOUTHWEST - TAMPA

STATION (Climatological) Wauchula Waste Water Plant (River Station, if different) MONTH Sept 2004

STATE Fl COUNTY Hardee RIVER

TIME (local) OF OBSERVATION RIVER 7:00 TEMP. PRECIPITATION STANDARD TIME IN USE

TYPE OF RIVER GAGE | ELEVATION OF RIVER GAGE ZERO Ft. | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

WS FORM B-91 (12-93)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (ins. and hundredths)	Snow, ice pellets (ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (ins.)	WEATHER (Calendar Day) Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	95	72	72														
2	91	72	75														
3	90	75	75														
4	91	71	78														
5	86	73	75	5.40													
6	86	74	75	.37													
7	87	76	78														
8	88	75	74														
9	90	75	76														
10	91	74	75														
11	91	74	76														
12	91	74	75														
13	98	75	76														
14	89	76	79														
15	90	75	78														
16	88	77	77														
17	93	77	77														
18	93	79	75														
19	92	71	72														
20	89	71	73														
21	82	71	73	.60													
22	84	73	74														
23	89	73	73														
24	90	71	71														
25	89	70	71														
26	90	71	71														
27	84	71	75														
28	87	73	74														
29	96	71	77														
30	[illegible]	[illegible]	72														
31																	
SUM			SUM	6.37			Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds					

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M.

Mark 'X' for all types occurring each day.

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage
F. Shore ice.
G. Floating ice.
H. Pool stage.

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING | DATE

OBSERVER

SUPERVISING OFFICE TAMPA BAY AREA (RUSKIN), FL (TBW)

STATION INDEX NO. 08-9401-04

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 30 2005
SOUTHWEST DIST. TAMPA

Wauchula Wastewater Plant | MONTH: Oct | 2004

WS FORM B-91 (12-93)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATE: Fl | COUNTY: Hardee | RIVER:

TIME (local) OF OBSERVATION RIVER: 7 00 | TEMP. | PRECIPITATION | STANDARD TIME IN USE

TYPE OF RIVER GAGE | ELEVATION OF RIVER GAGE ZERO Ft. | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (ins. and hundredths)	Snow, ice pellets, (ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (ins.)	REMARKS (Special observations, etc.)
1	91	71	73				
2	91	71	72				
3	90	71	73				
4	90	69	69				
5	91	69	73				
6	89	73	73				
7	88	72	74				
8	84	65	65				
9	87	65	66				
10	87	65	70				
11	85	70	74				
12	80	69	72	1.0			
13	86	69	69				
14	85	63	63				
15	86	62	66				
16	84	51	51	.44			
17	78	53	53				
18	83	53	61				
19	87	61	69				
20	89	69	69				
21	88	69	74				
22	87	67	68				
23	87	66	67				
24	83	60	62				
25	83	62	63				
26	85	62	62				
27	85	61	61				
28	83	60	61				
29	83	62	67				
30	84	64	65				
31	86	61	61				
SUM			SUM	1.44			

Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved.

A.M. 1 2 3 4 5 6 7 8 9 10 11 NOON P.M. 1 2 3 4 5 6 7 8 9 10 11

WEATHER (Calendar Day): Mark 'X' for all types occurring each day. Fog | Ice Pellets | Glaze | Thunder | Hail | Damaging Winds | Time of observation if different from above

RIVER STAGE: CONDITION | GAGE READING AT ___ A.M. | TENDENCY

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING | DATE

Fog | Ice Pel. | Glaze | Thund. | Hail | Dem. Winds

OBSERVER

SUPERVISING OFFICE: ~~TAMPA BAY~~ AREA (RUSKIN), FL (TBW)

STATION INDEX NO. 08-9401-04

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 30 2005
SOUTHWEST DIST. TAMPA

Wauchula Waste Water Plant | NOV | 2004

WS FORM B-91 (12-93)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATE: Fl
COUNTY: Hardee
RIVER:
TIME (local) OBSERVATION RIVER: 700 Am
TEMP.:
PRECIPITATION:
STANDARD TIME IN USE:
TYPE OF RIVER GAGE:
ELEVATION OF RIVER GAGE ZERO: Ft.
FLOOD STAGE: Ft.
NORMAL POOL STAGE: Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (ins. and hundredths)	Snow, ice pellets (ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (ins.)	REMARKS
1	87	61	71				
2	88	61	67				
3	88	61	61				
4	88	68	62				
5	88	68	68	.40			
6	73	58	58				
7	79	52	52				
8	79	48	48				
9	78	48	55				
10	82	55	64	.33			
11	80	62	65				
12	83	60	61				
13	82	59	60				
14	81	62	65				
15	83	59	60				
16	79	57	64				
17	77	55	58				
18	78	55	55				
19	78	52	52				
20	81	51	55				
21	82	54	54				
22	83	54	58				
23	83	54	61				
24	82	61	68				
25	85	68	75				
26	76	46	49				
27	78	48	55				
28	77	54	61				
29	77	52	52				
30	78	51	52				
31							
SUM			SUM	0.73			

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M. 1 2 3 4 5 6 7 8 9 10 11

WEATHER (Calendar Day): Mark 'X' for all types occurring each day. Fog | Ice Pellets | Glaze | Thunder | Hail | Damaging Winds | Time of observation if different from above

RIVER STAGE: CONDITION | GAGE READING AT ___ A.M. | TENDENCY

CONDITION OF RIVER AT GAGE
A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage
F. Shore ice.
G. Floating ice.
H. Pool stage.

CHECK BAR (For wire-weight) NORMAL CK. BAR
READING | DATE

Fog | Ice Pel. | Glaze | Thund. | Hail | Dam. Winds

OBSERVER

SUPERVISING OFFICE: TAMPA BAY AREA (RUSKIN), FL (TBW)

STATION INDEX NO.: 08-9401-04

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 30 2005
SOUTHWEST DISTRICT
TAMPA

STATION (Climatological) (River Station, if different) Wauchula Waste Water Plant

MONTH Dec 2004

WS FORM B-91
(12-93)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

STATE Fl | COUNTY Hardee | RIVER

TIME (local) OF OBSERVATION RIVER 700 | TEMP. | PRECIPITATION | STANDARD TIME IN USE

TYPE OF RIVER GAGE | ELEVATION OF RIVER GAGE ZERO Ft. | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)	WEATHER (Calendar Day) Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.,)
1	80	50	60														
2	82	52	61														
3	76	53	54														
4	71	43	43														
5	73	43	51														
6	78	50	55														
7	81	58	60														
8	83	55	60														
9	83	59	61														
10	83	57	58														
11	85	58	59														
12	72	41	49														
13	61	39	40														
14	76	40	53	,20													
15	62	35	36														
16	48	35	43														
17	70	43	54														
18	67	53	58														
19	70	50	50														
20	67	41	41														
21	54	33	39														
22	70	39	50														
23	76	50	66														
24	74	60	60	,20													
25	62	51	51	.25													
26	68	49	49														
27	68	38	39														
28	65	40	41														
29	71	49	49														
30	73	47	50														
31	74	50	60														
SUM			SUM	0.65			Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds					

Precipitation: Draw a straight line (——) through hours precipitation was observed, and a waved line (〰) through hours precipitation probably occurred unobserved. A.M. 1 2 3 4 5 6 7 8 9 10 11 NOON P.M. 1 2 3 4 5 6 7 8 9 10 11

Weather: Mark 'X' for all types occurring each day.

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage
F. Shore ice.
G. Floating ice.
H. Pool stage.

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

OBSERVER

SUPERVISING OFFICE TAMPA BAY AREA (RUSKIN), FL (TBW)

STATION INDEX NO. 08-9401-04

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 30 2005
SOUTHWEST DISTRICT
TAMPA

STATION (Climatological): Wauchula Waste Water Plant | (River Station, if different) | MONTH: Jan 2005

WS FORM B-91 (12-93)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

STATE: Fl | COUNTY: Hardee | RIVER:

TIME (local) OF OBSERVATION RIVER: 700 | TEMP. | PRECIPITATION | STANDARD TIME IN USE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

TYPE OF RIVER GAGE | ELEVATION OF RIVER GAGE ZERO Ft. | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)	Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	78	57	57														
2	77	53	55														
3	77	54	55														
4	78	50	50														
5	79	50	54														
6	80	53	60														
7	82	70	64														
8	83	57	58														
9	82	54	55														
10	81	54	55														
11	81	53	54														
12	80	54	54														
13	80	54	67														
14	82	66	72	2.15													
15	82	56	57														
16	69	54	54														
17	61	40	43														
18	57	38	38														
19	62	38	41														
20	67	40	42														
21	67	42	48														
22	73	48	59														
23	73	48	51														
24	58	33	33														
25	51	32	36														
26	66	34	42														
27	73	42	57														
28	78	55	55														
29	67	54	59														
30	74	56	56														
31	77	52	52														
SUM			SUM	2.15			Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds					

Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M.

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER

SUPERVISING OFFICE: TAMPA BAY AREA (RUSKIN), FL (TBW)

STATION INDEX NO. 08-9401-04

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 30 2005
SOUTHWEST DISTRICT
TAMPA

STATION (Climatological)	River Station (if different)	MONTH	YEAR
Wauchula Waste Water Plant		Feb	2005

STATE	COUNTY	RIVER
Fl	HARDEE	

TIME (local) OF OBSERVATION RIVER	TEMP.	PRECIPITATION	STANDARD TIME IN USE
700			

TYPE OF RIVER GAGE	ELEVATION OF RIVER GAGE ZERO Ft.	FLOOD STAGE Ft.	NORMAL POOL STAGE Ft.

WS FORM B-91
(12-93)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)	WEATHER (Calendar Day) Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	69	46	48														
2	74	46	54														
3	72	53	60														
4	79	53	54														
5	55	44	44														
6	68	43	52														
7	74	52	56														
8	76	50	51														
9	76	48	48														
10	79	48	61														
11	79	41	41														
12	62	33	33														
13	64	32	39														
14	76	38	48														
15	81	48	52														
16	81	51	51														
17	82	51	52														
18	79	52	51														
19	71	43	45														
20	75	45	46														
21	80	48	51														
22	82	50	59														
23	82	59	77														
24	84	59	62														
25	82	60	64														
26	77	61	62														
27	76	61	66	2.60													
28	76	62	62														
29																	
30																	
31																	
SUM			SUM	2.6			Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds					

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M. 1 2 3 4 5 6 7 8 9 10 11 | 1 2 3 4 5 6 7 8 9 10 11

WEATHER: Mark 'X' for all types occurring each day.

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage.
F. Shore ice.
G. Floating ice.
H. Pool stage.

CHECK BAR (For wire-weight) NORMAL CK. BAR READING	DATE

OBSERVER

SUPERVISING OFFICE

TAMPA BAY AREA (RUSKIN), FL (TBW)

STATION INDEX NO.
08-9401-04

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 30 2005
SOUTHWEST DISTRICT
TAMPA

STATION (Climatological): Wauchula Wastewater Plant (River Station, if different)
MONTH: March 2005

WS FORM B-91 (12/00)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

STATE: Florida
COUNTY: Hardee
RIVER:

TIME (local) OF OBSERVATION RIVER | TEMP. | PRECIPITATION | STANDARD TIME IN USE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

TYPE OF RIVER GAGE | ELEVATION OF RIVER GAGE ZERO Ft. | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, hail (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)	REMARKS (Special observations, etc.)
1	77	52	52				
2	70	43	44				
3	66	44	49				
4	57	49	50				
5	69	43	43				
6	72	43	50				
7	74	50	52				
8	78	57	68				
9	71	50	53				
10	54	46	47				
11	73	43	46				
12	73	45	47				
13	74	46	46				
14	57	45	56				
15	82	57	65				
16	78	68	69				
17	85	66	66				
18	67	56	57	1.63			
19	67	44	44				
20	69	44	46				
21	77	46	73	.06			
22	80	64	70				
23	87	69	69				
24	76	63	64	1.40			
25	85	71	71				
26	86	71	72				
27	89	69	73				
28	87	70	70				
29	76	52	58				
30	81	46	49				
31	82	48	52				
SUM			SUM	3.09			

WEATHER (Calendar Day): Mark 'X' for all types occurring each day. Fog | Ice Pellets | Glaze | Thunder | Hail | Damaging Winds | Time of observation if different from above

RIVER STAGE: CONDITION | GAGE READING AT ___ A.M. | TENDENCY

CHECK BAR (For wire-weight) NORMAL CK. BAR — READING | DATE

CONDITION OF RIVER AT GAGE
A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER

SUPERVISING OFFICE: TAMPA BAY AREA (RUSKIN), FL (TBW)

STATION INDEX NO. 08-9401-04

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOUTHWEST ... TAMPA
NOV 30 2005

STATION (Climatological) City of Wauchula WWTP (River Station, if different)

MONTH April 2005

STATE Florida | COUNTY Hardee | RIVER

TIME (local) OF OBSERVATION RIVER | TEMP. | PRECIPITATION | STANDARD TIME IN USE

TYPE OF RIVER GAGE | ELEVATION OF RIVER GAGE ZERO Ft. | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

WS FORM B-91
(12/00)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, hail. (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)	WEATHER (Calendar Day) Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	88	66	68	.55													
2	87	69	73	.28													
3	74.5	50.6	65														
4	74.3	44.2	44.2														
5	81.	44	51														
6	82	51	58														
7	84	64	64														
8	85	62	64	.53													
9	80	57	60														
10	80	56	59														
11	81	56	60														
12	83	54	63														
13	82	52	64														
14	84	52	52														
15	80	52	53														
16	80	51	55														
17	74	47	57														
18	77	50	51														
19	76	52	55														
20	79	53	57														
21	81	50	54														
22	85	60	61														
23	85	54	55														
24	83	53	53	.27													
25	83	42	43														
26	83	42	56														
27	88	42	67	1.75													
28	88	42.	56														
29	88	42	71														
30	88	42	73														
31																	
SUM			SUM	3.38			Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds					

PRECIPITATION: Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved. A.M. 1 2 3 4 5 6 7 8 9 10 11 NOON P.M. 1 2 3 4 5 6 7 8 9 10 11

WEATHER: Mark 'X' for all types occurring each day.

FLORIDA DEPARTMENT
ENVIRONMENTAL PR...
NOV 30 2005
SOUTHWEST
TAMPA

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage
F. Shore ice.
G. Floating ice.
H. Pool stage.

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

OBSERVER

SUPERVISING OFFICE

[redacted]A BAY AREA (RUSKIN), FL (TBW)

STATION INDEX NO.
08-9401-04

STATION (Climatological) City of Wauchula WWTP (River Station, if different) MONTH May 20 05

STATE Florida COUNTY Hardee RIVER

TIME (local) OF OBSERVATION RIVER TEMP. PRECIPITATION STANDARD TIME IN USE

TYPE OF RIVER GAGE ELEVATION OF RIVER GAGE ZERO Ft. FLOOD STAGE Ft. NORMAL POOL STAGE Ft.

WS FORM B-91 (12/00)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, hail, (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)	WEATHER (Calendar Day)	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc..)
1	89	67	68									
2	82.4	66.2	67.6									
3	84.9	65.8	69.6	1.50								
4	84.9	65.8	69.8	.34								
5	84.9	65.8	69.2									
6	84.9	64.4	65.1									
7	85	54	54									
8	82	54	58									
9	83.3	56.8	57.0									
10	85.1	56.8	76.6									
11	85.6	56.8	67.1	.50								
12	86.1	60.9	62.9									
13	85.2	59.9	63.5									
14	84.	55.	77									
15	87.	63.	63									
16	86.3	63.3	65.6									
17	88.5	65.6	68.1									
18	88.7	65.6	71.9									
19	86.7	64.4	79.8									
20	86.9	62.6	63.8									
21	85.	64.	65									
22	88	65	69									
23	88.5	62.6	71.9									
24	90.8	68.1	72.8									
25	89.6	73.0	77.5	.46								
26	91.7	67.2	68.0									
27	84.2	65.6	65.8									
28	88	65	66									
29	90	66	68									
30	91	67	68									
31	96.0	68.5	70.3									
SUM			SUM	2.8								

Precipitation: Draw a straight line (——) through hours precipitation was observed, and a waved line (～～) through hours precipitation probably occurred unobserved. A.M. NOON P.M.

Weather: Mark 'X' for all types occurring each day. Fog, Ice Pellets, Glaze, Thunder, Hail, Damaging Winds

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING DATE

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage
F. Shore ice.
G. Floating ice.
H. Pool stage.

OBSERVER

SUPERVISING OFFICE TAMPA BAY AREA (RUSKIN), FL (TBW)

STATION INDEX NO. 08-9401-04

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 30 2005
SOUTHWEST D...
TAMPA

STATION (Climatological) City of Wauchula WWTP (River Station, if different)

MONTH June 20 05

STATE Florida COUNTY Hardee RIVER

TIME (local) OF OBSERVATION RIVER | TEMP. | PRECIPITATION | STANDARD TIME IN USE

TYPE OF RIVER GAGE | ELEVATION OF RIVER GAGE ZERO Ft. | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

WS FORM B-91 (12/00)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, hail (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)	WEATHER (Calendar Day) Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	85.8	69.6	69.8	1.45													
2	81.1	68.6	71.4	1.75													
3	81.8	67.8	74.1	1.30													
4	77.0	70.0	73.0	1.45													
5	84.0	69.0	70.0	1.60													
6	84.2	70.7	71.4														
7	89.0	71.2	72.6	.08													
8	90.6	69.9	72.8														
9	90.5	72.8	76.1	.10													
10	88.7	74.3	76.8	.85													
11	79.0	75.0	77.0	.77													
12	88.0	75.0	76.0	2.50													
13	89.2	73.9	74.1														
14	90.1	69.5	75.2														
15	92.4	73.7	75.0														
16	94.2	73.9	75.2														
17	92.1	73.4	75.7														
18	91.7	74.3	83.3														
19	90.5	70.7	70.7	.31													
20	91.5	70.7	72.6	.94													
21	85.5	71.9	72.6														
22	85.6	72.5	75.5	.30													
23	85.6	70.5	71.4	.34													
24	86.0	71.0	72.0														
25	86.0	71.0	71.0	.05													
26	85.0	71.0	77.0														
27	92.4	73.5	75.3	1.21													
28	92.4	73.5	75.7	.27													
29	91.4	74.8	74.8	.30													
30	88.[illegible]	73.7	73.9	.63													
31																	
SUM			SUM	16.2			Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds					

Precipitation: Draw a straight line (——) through hours precipitation was observed, and a waved line (〰) through hours precipitation probably occurred unobserved. A.M. 1 2 3 4 5 6 7 8 9 10 11 NOON P.M. 1 2 3 4 5 6 7 8 9 10 11

Weather: Mark 'X' for all types occurring each day.

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage
F. Shore ice.
G. Floating ice.
H. Pool stage.

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

OBSERVER

SUPERVISING OFFICE

STATION INDEX NO. 08-9401-04

~~TAMPA BAY AREA (RUSKIN), FL (TBW)~~

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 30 2005
SOUTHWEST DISTRICT
TAMPA

STATION (City, Local) City of Wauchula WWTP (River Station, if different) | MONTH July | 20 05

STATE Florida | COUNTY Hardee | RIVER

TIME (local) OF OBSERVATION RIVER | TEMP. | PRECIPITATION | STANDARD TIME IN USE

TYPE OF RIVER GAGE | ELEVATION OF RIVER GAGE ZERO Ft. | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

WS FORM B-91 (2/00)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

TEMPERATURE F. — 24 HRS. ENDING AT OBSERVATION

PRECIPITATION — 24-HR AMOUNTS; At Ob. — Draw a straight line (——) through hours precipitation was observed, and a waved line (~~~) through hours precipitation probably occurred unobserved. A.M. NOON P.M.

WEATHER (Calendar Day) — Mark 'X' for all types occurring each day.

RIVER STAGE

DATE	MAX.	MIN.	AT OBSN.	Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, hail, (Ins. and tenths)	Snow, ice pellets, hail, ice on ground (Ins.)	Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	CONDITION	GAGE READING AT ___ A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	89.6	74.3	75.0	.30													
2	88.	74.	75.														
3	88	77	74														
4	93.2	74.6	74.6														
5	94.6	73.1	74.4														
6	94.2	72.8	74.4														
7	94.4	73.9	73.9														
8	94.1	76.2	77.1														
9	94.	72.	72.	2.05													
10	81.	74.	79														
11	86.0	76.1	76.2														
12	93.5	73.5	74.4														
13	93.0	74.4	75.7	1.20													
14	92.4	73.2	74.3	1.93													
15	93.2	73.2	73.9														
16	93.	74.	76.	.98													
17	94.	75.	76.	.56													
18	91.4	75.5	76.1														
19	89.6	74.8	75.2														
20	91.5	75.2	76.4														
21	91.9	73.2	73.5														
22	93.5	76.8	77.0														
23	94.	75.	76.														
24	95.	76.	78.	1.59													
25	93.2	74.1	75.3														
26	91.7	75.3	78.4														
27	92.8	76.2	76.4														
28	94.8	76.4	76.4	.04													
29	94.4	73.9	74.3	.02													
30	95.	73.	73.	.79													
31	93.	72.	73.	.003													
SUM			SUM	9.46			Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds					

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage
F. Shore ice.
G. Floating ice.
H. Pool stage.

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

OBSERVER

SUPERVISING OFFICE TAMPA BAY AREA (RUSKIN), FL (TBW)

STATION INDEX NO. 08-9401-04

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 30 2005
SOUTHWEST DISTRICT
TAMPA

STATION (Climatological): City of Wauchula WWTP (River Station, if different) MONTH: Aug 20 05

STATE: Florida COUNTY: Hardee RIVER:

TIME (local) OF OBSERVATION RIVER | TEMP. | PRECIPITATION | STANDARD TIME IN USE

TYPE OF RIVER GAGE | ELEVATION OF RIVER GAGE ZERO Ft. | FLOOD STAGE Ft. | NORMAL POOL STAGE Ft.

WS FORM B-91 (12/00)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

RECORD OF RIVER AND CLIMATOLOGICAL OBSERVATIONS

DATE	TEMPERATURE F. 24 HRS. ENDING AT OBSERVATION MAX.	MIN.	AT OBSN.	PRECIPITATION 24-HR AMOUNTS Rain, melted snow, etc. (Ins. and hundredths)	Snow, ice pellets, hail. (Ins. and tenths)	At Ob. Snow, ice pellets, hail, ice on ground (Ins.)	WEATHER (Calendar Day) Fog	Ice Pellets	Glaze	Thunder	Hail	Damaging Winds	Time of observation if different from above	RIVER STAGE CONDITION	GAGE READING AT A.M.	TENDENCY	REMARKS (Special observations, etc.)
1	93.3	72.3	87.6	.14													
2	93.9	73.5	73.5														
3	93.0	73.2	74.1														
4	94.1	73.7	73.9	.003													
5	95.1	72.8	73.0														
6	93	71	71	.07													
7	91	69	73	.29													
8	91.4	69.4	72.8	.27													
9	88.8	72.8	73.2	.50													
10	90	73	74														
11	95.0	73.9	74.8														
12	93.5	75.2	75.7	.16													
13	95.7	72.6	89.0														
14	93.0	75.2	75.3	.02													
15	94.8	71.0	71.4														
16	92	71	77														
17	95.9	77.0	77.3														
18	97.1	73.5	73.7														
19	96.6	75.5	76.1														
20	96.	73	74														
21	97	74	74														
22	94.8	73.7	73.9	.60													
23	94.4	73.4	73.4														
24	93.5	74.1	73.9														
25	93.0	72.5	78.9	.69													
26	87.8	76.1	77.1	.08													
27	88.8	74.6	80.4														
28	90.3	76.6	78.0	.003													
29	93.3	77.0	78.0														
30	94.6	72.5	77.7														
31	93.7	75.2	75.5	.19													
SUM			SUM	4.22			Fog	Ice Pel.	Glaze	Thund.	Hail	Dam. Winds					

Draw a straight line (——) through hours precipitation was observed, and a waved line (〰) through hours precipitation probably occurred unobserved.

A.M. 1 2 3 4 5 6 7 8 9 10 11 NOON P.M. 1 2 3 4 5 6 7 8 9 10 11

Mark 'X' for all types occurring each day.

CHECK BAR (For wire-weight) NORMAL CK. BAR

READING	DATE

CONDITION OF RIVER AT GAGE

A. Obstructed by rough ice.
B. Frozen, but open at gage.
C. Upper surface of smooth ice.
D. Ice gorge above gage.
E. Ice gorge below gage
F. Shore ice.
G. Floating ice.
H. Pool stage.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 30 2005
SOUTHWEST DISTRICT
TAMPA

OBSERVER

SUPERVISING OFFICE

STATION INDEX NO. 08-9401-04

TAMPA BAY AREA (RUSKIN), FL (TBW)

HARDEE COUNTY LANDFILL
HARDEE COUNTY, FLORIDA
MONTHLY RAINFALL DATA 1990-2004

Month	Rainfall (inch)
Jan-90	0.14
Feb-90	4.96
Mar-90	0.68
Apr-90	2.71
May-90	2.05
Jun-90	5.34
Jul-90	10.76
Aug-90	10.8
Sep-90	5.65
Oct-90	1.43
Nov-90	0.45
Dec-90	1.03
1990 Total:	46.00

Month	Rainfall (inch)
Jan-91	2.59
Feb-91	1.31
Mar-91	4.35
Apr-91	4.18
May-91	4.05
Jun-91	12.94
Jul-91	10.25
Aug-91	7.37
Sep-91	2.21
Oct-91	3.47
Nov-91	0.12
Dec-91	0.28
1991 Total:	53.12

Month	Rainfall (inch)
Jan-92	0.3
Feb-92	5.21
Mar-92	2.07
Apr-92	6.44
May-92	1.61
Jun-92	12.75
Jul-92	2.91
Aug-92	12.76
Sep-92	4.95
Oct-92	2.95
Nov-92	1.55
Dec-92	0.69
1992 Total:	54.19

Month	Rainfall (inch)
Jan-93	5.93
Feb-93	2.15
Mar-93	5.52
Apr-93	4.34
May-93	2.42
Jun-93	7.62
Jul-93	7.47
Aug-93	6.24
Sep-93	5.23
Oct-93	5.16
Nov-93	0.72
Dec-93	1.27
1993 Total:	54.07

Month	Rainfall (inch)
Jan-94	3.2
Feb-94	1.58
Mar-94	3.34
Apr-94	1.45
May-94	2.71
Jun-94	13.04
Jul-94	7.29
Aug-94	7.44
Sep-94	no data
Oct-94	no data
Nov-94	no data
Dec-94	no data
1994 Total:	40.05

Month	Rainfall (inch)
Jan-95	no data
Feb-95	no data
Mar-95	no data
Apr-95	6.6
May-95	0.65
Jun-95	8.56
Jul-95	11.41
Aug-95	9.99
Sep-95	5.58
Oct-95	8.64
Nov-95	1.45
Dec-95	0.33
1995 Total:	53.21

Month	Rainfall (inch)
Jan-96	2.67
Feb-96	1.38
Mar-96	3.79
Apr-96	0.76
May-96	4.25
Jun-96	4.24
Jul-96	3.71
Aug-96	8.56
Sep-96	7.83
Oct-96	3.49
Nov-96	0.74
Dec-96	2.51
1996 Total:	43.93

Month	Rainfall (inch)
Jan-97	0.44
Feb-97	0.3
Mar-97	2.6
Apr-97	5.95
May-97	2.85
Jun-97	7.42
Jul-97	12.26
Aug-97	8.66
Sep-97	5.38
Oct-97	3.24
Nov-97	10.38
Dec-97	6.29
1997 Total:	65.77

Month	Rainfall (inch)
Jan-98	6.09
Feb-98	8.82
Mar-98	12.14
Apr-98	2.53
May-98	3.57
Jun-98	1.69
Jul-98	6.78
Aug-98	7.58
Sep-98	10.19
Oct-98	1.76
Nov-98	3.34
Dec-98	1.56
1998 Total:	66.05

Month	Rainfall (inch)
Jan-99	3.73
Feb-99	0.8
Mar-99	0.87
Apr-99	2.65
May-99	2.47
Jun-99	4.08
Jul-99	2.9
Aug-99	7.26
Sep-99	5.5
Oct-99	5.61
Nov-99	2
Dec-99	2.4
1999 Total:	40.27

Month	Rainfall (inch)
Jan-00	0
Feb-00	0
Mar-00	0.85
Apr-00	1.4
May-00	0
Jun-00	3.18
Jul-00	5.8
Aug-00	5.62
Sep-00	10.47
Oct-00	0
Nov-00	0.79
Dec-00	1.45
2000 Total:	29.56

Month	Rainfall (inch)
Jan-01	0
Feb-01	0
Mar-01	6.98
Apr-01	0
May-01	5.37
Jun-01	9.16
Jul-01	13.31
Aug-01	6.15
Sep-01	7.03
Oct-01	0.67
Nov-01	0.8
Dec-01	0
2001 Total:	49.47

Month	Rainfall (inch)
Jan-02	2.02
Feb-02	6.03
Mar-02	0
Apr-02	4.28
May-02	1.77
Jun-02	9.02
Jul-02	7.17
Aug-02	7.24
Sep-02	3.46
Oct-02	4.87
Nov-02	8.46
Dec-02	7.89
2002 Total:	62.21

Month	Rainfall (inch)
Jan-03	1.28
Feb-03	2.05
Mar-03	2.02
Apr-03	3.45
May-03	5.07
Jun-03	11.9
Jul-03	4.4
Aug-03	12.28
Sep-03	4.55
Oct-03	1.27
Nov-03	0.76
Dec-03	2.61
2003 Total:	51.64

Month	Rainfall (inch)
Jan-04	1.94
Feb-04	3.4
Mar-04	0.57
Apr-04	1.13
May-04	0.7
Jun-04	9.92
Jul-04	7
Aug-04	--
Sep-04	--
Oct-04	--
Nov-04	--
Dec-04	--
2004 Total:	24.66

AVERAGE MONTHLY RAINFALL DISTRIBUTION

Month	Rainfall (inch)
Jan	2.17
Feb	2.71
Mar	3.27
Apr	3.19
May	2.64
Jun	8.06
Jul	7.56
Aug	8.43
Sep	6.00
Oct	3.27
Nov	2.43
Dec	2.18
Average:	51.90

Source: NOAA Weather Station - Wachula
Coop ID # 089401

Note:
Monthly averages do not include months with "No Data' Reported.

D.E.P.
MAY 23 2005
Southwest District Tampa

SCS ENGINEERS

SHEET 1 of 1

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY:	DATE:
HELP Model Summary	LEK	4/19/2005
Comparison of HELP Models with Additional Rainfall Data	CHECKED JHO	DATE 5/20/05

LEACHATE COLLECTION AND REMOVAL SYSTEM

Peak Conditions

1990-2003 Rainfall Data

Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)
0.110	10,012

1990-2004 Rainfall Data

Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)
0.107	9,658

Average Conditions

1990-2003 Rainfall Data

Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)
0.001	77,435

1990-2004 Rainfall Data

Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)
0.001	75,810

D.E.P.
MAY 23 2005
Southwest District Tampa

LEACHATE DETECTION SYSTEM

Peak Conditions

1990-2003 Rainfall Data

Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)
0.000	29

1990-2004 Rainfall Data

Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)
0.000	29

Average Conditions

1990-2003 Rainfall Data

Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)
0.000	1,264

1990-2004 Rainfall Data

Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)
0.000	1,255

As shown above, the addition of the 2003 rainfall data (September thru December) and 2004 rainfall data (January thru July) does not alter the HELP model results significantly. The additional 2003 and 2004 data reduces the average monthly rainfall as shown below. Since the HELP model results with the additional rainfall data are less than the values submitted with the original permit application, it is SCS's professional opinion that the original HELP model results should be used for estimates since they are produce more conservative

Month	Updated 1990-2004 Rainfall Data (inch)	Original 1990-2003 Rainfall Data (inch)
Jan	2.17	2.18
Feb	2.71	2.66
Mar	3.27	3.48
Apr	3.19	3.34
May	2.64	2.77
Jun	8.06	7.92
Jul	7.56	7.6
Aug	8.43	8.43
Sep	6.00	6.12
Oct	3.27	3.44
Nov	2.43	2.57
Dec	2.18	2.14
Total:	51.90	52.65

Note: Updated rainfall data 1990-2004 from NOAA weather station in the City of Wauchula; Original rainfall 1990-2003 (excluding Sept2003 to Dec 2003) also from NOAA weather station in the City of Wauchula.

JOSEPH ... O'NEILL LICENSE ... STATE OF FLORIDA PROFESSIONAL ENGINEER

SCS ENGINEERS

SHEET 1 of 1

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY:	DATE:
HELP Model Summary	LEK	5/23/2005
Comparison on Clay Hydraulic Conductivity	CHECKED: JHO	DATE: 5/27/2005

Compare two help model runs with the original hydraulic conductivity used (1.8×10^{-5} cm/sec) and that specified in the construction specifications (1×10^{-5} cm/sec).

The scenario modeled in the HELP program was the initial lift of waste with the a slope length of 45.6 feet and a slope of 2.19%. The original model with the 1.8×10^{-5} cm/sec results are located in Table 1. This model is located in the original Construction Permit Application dated April 2004. The original model uses site specific rainfall data for 1990 thru 2003. The revised HELP model, with the hydraulic conductivity of 1x10-5 cm/sec uses updated rainfall data for 1990 thru 2004. Refer to Table 2 for a comparison of the monthly averages for rainfall.

Table 1. Comparison of HELP Models

Hydraulic Conductivity (cm/sec)	Rainfall Used	Head on the Primary Liner (inches)	Head on the Secondary Liner (inches)	Percolation/ Leakage thru Clay (ft^3/day)
$1.8x\text{-}10^{-5}$	1990-2003*	0.110	0.000	0.00003
1.0×10^{-5}	1990-2004*	0.110	0.000	0.00002

Table 2. Comparison of Rainfall Data

Month	Updated 1990-2004 Rainfall Data (inch)	Original 1990-2003 Rainfall Data (inch)
Jan	2.17	2.18
Feb	2.71	2.66
Mar	3.27	3.48
Apr	3.19	3.34
May	2.64	2.77
Jun	8.06	7.92
Jul	7.56	7.6
Aug	8.43	8.43
Sep	6.00	6.12
Oct	3.27	3.44
Nov	2.43	2.57
Dec	2.18	2.14
Total:	51.90	52.65

D.E.P.
MAY 2 3 2005
Southwest District Tampa

CONCLUSION:

The clay layer specified and constructed will have a hydraulic conductivity of 1×10^{-5} cm/sec value for the subbase. The difference in leakage and head over liner in both the collection and detection system is negligible. The original HELP models are accurate and therefore, additional modeling is not required.

JOSEPH M. O'NEILL
LICENSE
No.
STATE OF FLORIDA
PROFESSIONAL ENGINEER

Open Cell
L = 45.0 ft
S = 2.19%


```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**             HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                   **
**              DEVELOPED BY ENVIRONMENTAL LABORATORY                       **
**                USAE WATERWAYS EXPERIMENT STATION                         **
**          FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                 **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************
```

```
PRECIPITATION DATA FILE:     P:\HELP\HARDEE.D4
TEMPERATURE DATA FILE:       P:\HELP\HARDEE.D7
SOLAR RADIATION DATA FILE:   P:\HELP\HARDEE.D13
EVAPOTRANSPIRATION DATA:     P:\HELP\HARDEE.D11
SOIL AND DESIGN DATA FILE:   P:\HELP\HARDEE3.D10
OUTPUT DATA FILE:            P:\HELP\HARDEE3.OUT
```

TIME: 12: 0   DATE: 5/ 2/2005

****

TITLE: Hardee County LF Expansion-Case 2: Initial Waste Placement

****

Slope Length = 47.2 ft
Slope = 2.19%

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER Drainage Sand
MATERIAL TEXTURE NUMBER 5

```
THICKNESS                  =     24.00   INCHES = 2 ft
POROSITY                   =     0.4570 VOL/VOL
FIELD CAPACITY             =     0.1310 VOL/VOL
WILTING POINT              =     0.0580 VOL/VOL
INITIAL SOIL WATER CONTENT =     0.1987 VOL/VOL
EFFECTIVE SAT. HYD. COND.  =  0.100000005000E-02 CM/SEC
```

NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 1.80 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

Primary System

LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER Biplanar Geocomposite
MATERIAL TEXTURE NUMBER 0

```
THICKNESS                  =      0.30   INCHES = 300 mils
POROSITY                   =      0.8500 VOL/VOL
FIELD CAPACITY             =      0.0100 VOL/VOL
WILTING POINT              =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT =      0.0150 VOL/VOL
EFFECTIVE SAT. HYD. COND.  =  17.7000008000      CM/SEC   Virgin Hydraulic Conductivity
SLOPE                      =      2.19   PERCENT
DRAINAGE LENGTH            =     45.6    FEET
```

LAYER 3

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
MAY 23 2005
SOUTHWEST DISTRICT
TAMPA

Open Cell
L = 45.6 ft
S = 2.19%

TYPE 4 - FLEXIBLE MEMBRANE LINER Textured Liner
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES = 60 mils
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

Secondary System

LAYER 4

TYPE 2 - LATERAL DRAINAGE LAYER Triplanar Geocomposite
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.30 INCHES = 300 mils
POROSITY	=	0.8500 VOL/VOL
FIELD CAPACITY	=	0.0100 VOL/VOL
WILTING POINT	=	0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT	=	~~0.0100 VOL/VOL~~
EFFECTIVE SAT. HYD. COND.	=	26.2000008000 CM/SEC Virgin Hydraulic Conductivity
SLOPE	=	2.19 PERCENT
DRAINAGE LENGTH	=	45.6 FEET

LAYER 5

TYPE 4 - FLEXIBLE MEMBRANE LINER Textured Liner
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES = 60 mils
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

LAYER 6

TYPE 3 - BARRIER SOIL LINER Clay
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	6.00 INCHES = 0.5 ft
POROSITY	=	0.4190 VOL/VOL
FIELD CAPACITY	=	0.3070 VOL/VOL
WILTING POINT	=	0.1800 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4190 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999975000E-05 CM/SEC = 0.00000999 $\frac{cm}{s}$ = 1×10^{-5} $\frac{cm}{s}$

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	74.00
FRACTION OF AREA ALLOWING RUNOFF	=	0.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000 ACRES
EVAPORATIVE ZONE DEPTH	=	6.0 INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	0.445 INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.742 INCHES

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
MAY 23 2005
SOUTHWEST DISTRICT
TAMPA

Open Cell
L = 45.6 ft
S = 2.19%

HARDEE3

LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.348	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	7.289	INCHES
TOTAL INITIAL WATER	=	7.289	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
TAMPA FLORIDA

STATION LATITUDE	=	24.57	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	0	
END OF GROWING SEASON (JULIAN DATE)	=	367	
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	72.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	78.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
2.18	2.66	3.48	3.34	2.77	7.92
7.60	8.43	6.12	3.44	2.57	2.14

Site Specific Rainfall
1990 - 2004

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.80	60.80	66.20	71.60	77.10	80.90
82.20	82.20	80.90	74.50	66.70	61.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA
AND STATION LATITUDE = 27.58 DEGREES

****

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
MAY 23 2005
SOUTHWEST DISTRICT
TAMPA

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	50.95	(8.218)	184948.5	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
EVAPOTRANSPIRATION	29.228	(3.6451)	106098.21	57.366
LATERAL DRAINAGE COLLECTED FROM LAYER 2	21.38720	(5.41138)	77635.547	41.97684
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.34984	(0.04115)	1269.903	0.68663
AVERAGE HEAD ON TOP OF LAYER 3	0.001	(0.000)		
LATERAL DRAINAGE COLLECTED	0.34984	(0.04115)	1269.902	0.68662

Avg. Annual Q from Primary System

Avg head = 0.001" < 0.3", the virgin biplanar geocomposite thickness

Avg Annual Q from Secondary System

Open Cell
L = 45.6 ft
S = 2.19%

FROM LAYER 4

PERCOLATION/LEAKAGE THROUGH LAYER 6	0.00000 (	0.00000)	0.002	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.000 (	0.000)		
CHANGE IN WATER STORAGE	-0.015 (	0.4809)	-55.17	-0.030

Avg Head < 0.3, the virgin triplanar geocomposite thickness

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)	
PRECIPITATION	5.91	21453.299	
RUNOFF	0.000	0.0000	
DRAINAGE COLLECTED FROM LAYER 2	2.74399	9960.68652	Peak flow from Primary System
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.008111	29.44253	
AVERAGE HEAD ON TOP OF LAYER 3	0.057		
MAXIMUM HEAD ON TOP OF LAYER 3	0.110		< 0.3" (Virgin Biplanar Geocomposite Thickness)
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	1.6 FEET		
DRAINAGE COLLECTED FROM LAYER 4	0.00811	29.44251	Peak flow from Secondary System
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.000000	0.00002	
AVERAGE HEAD ON TOP OF LAYER 5	0.001		
MAXIMUM HEAD ON TOP OF LAYER 5	0.000		< 0.3" (Virgin Triplanar Geocomposite Thickness)
LOCATION OF MAXIMUM HEAD IN LAYER 4 (DISTANCE FROM DRAIN)	0.0 FEET		
SNOW WATER	0.00	0.0000	

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3979
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0580

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	4.3133	0.1797
2	0.0031	0.0104

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
MAY 23 2005
SOUTHWEST DISTRICT
TAMPA

Open cell:
L = 45.6 ft
S = 2.19%

3	0.0000	0.0000
4	0.0030	0.0100
5	0.0000	0.0000
6	2.5140	0.4190
SNOW WATER	0.000	

****
****

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
MAY 23 2005
SOUTHWEST DISTRICT
TAMPA

HELP Model - Initial Waste Placement

$L = 45.6$ ft
$S = 2.19\%$

21
Initial
L= 45.6'
S= 2.19%


```
****************************************************************************
****************************************************************************
**                                                                        **
**                                                                        **
**            HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**              HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**               DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                 USAE WATERWAYS EXPERIMENT STATION                      **
**           FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                        **
**                                                                        **
****************************************************************************
****************************************************************************


PRECIPITATION DATA FILE:      P:\HELP\HARDEE.D4
TEMPERATURE DATA FILE:        p:\help\HARDEE.D7
SOLAR RADIATION DATA FILE:    p:\help\HARDEE.D13
EVAPOTRANSPIRATION DATA:      p:\help\HARDEE.D11
SOIL AND DESIGN DATA FILE:    p:\help\HARDEE3.D10
OUTPUT DATA FILE:             p:\help\HARDEE29.OUT


TIME:  14:52     DATE:   2/ 5/2004


****************************************************************************

     TITLE:  Hardee County LF Expansion-Case 1: Initial Waste Placement

****************************************************************************
                                           Slope Length = 45.6'
                                           Slope = 2.19%

     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                            LAYER  1 - Drainage Sand
                            --------

                   TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER   5
          THICKNESS                  =        24.00  INCHES = 2 ft.
          POROSITY                   =        0.4570 VOL/VOL
          FIELD CAPACITY             =        0.1310 VOL/VOL
          WILTING POINT              =        0.0580 VOL/VOL
          INITIAL SOIL WATER CONTENT =        0.1987 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  =  0.100000005000E-02 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
                FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                       Primary System
                            LAYER  2 - Biplanar Geocomposite
                            --------
```

6/

Initial

L = 45.6'

S = 2.19 %

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.30 INCHES = 300 mils
POROSITY	=	0.8500 VOL/VOL
FIELD CAPACITY	=	0.0100 VOL/VOL
WILTING POINT	=	0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0150 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	17.7000008000 CM/SEC
SLOPE	=	2.19 PERCENT
DRAINAGE LENGTH	=	45.6 FEET

Sheet 3 of Attachment H-5

Sheet 3 of Attachment H-5

LAYER 3 - Textured Liner

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES = 60 mils
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

Secondary System

LAYER 4 - Triplanar Geocomposite

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.30 INCHES = 300 mils
POROSITY	=	0.8500 VOL/VOL
FIELD CAPACITY	=	0.0100 VOL/VOL
WILTING POINT	=	0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	26.2000008000 CM/SEC
SLOPE	=	2.19 PERCENT
DRAINAGE LENGTH	=	45.6 FEET

See sheet 4 of Attachment H-5

LAYER 5 - Textured Liner

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES = 60 mils
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00 HOLES/ACRE

7/

Initial
L= 45.6'
S= 2.19

FML PLACEMENT QUALITY = 3 - GOOD

LAYER 6 – Clay

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 22

THICKNESS	=	6.00	INCHES = 0.5 ft.
POROSITY	=	0.4190	VOL/VOL
FIELD CAPACITY	=	0.3070	VOL/VOL
WILTING POINT	=	0.1800	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4190	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.189999992000E-04	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	74.00	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	0.445	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.742	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.348	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	7.289	INCHES
TOTAL INITIAL WATER	=	7.289	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
TAMPA FLORIDA

STATION LATITUDE	=	24.57	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	0	
END OF GROWING SEASON (JULIAN DATE)	=	367	
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	72.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	78.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA

81

Initial

L=45.6'

S=2.19%

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
2.18	2.66	3.48	3.34	2.77	7.92
7.60	8.43	6.12	3.44	2.57	2.14

Site Specific rainfa
Attachment H-4

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.80	60.80	66.20	71.60	77.10	80.90
82.20	82.20	80.90	74.50	66.70	61.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR TAMPA FLORIDA AND STATION LATITUDE = 27.58 DEGREES

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	50.56	(7.101)	183529.2	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
EVAPOTRANSPIRATION	28.893	(2.9697)	104883.03	57.148
LATERAL DRAINAGE COLLECTED FROM LAYER 2	21.33205	(5.22556)	$\boxed{77435.336}$	42.19238
			Avg. Annual Q from Primary Syste	
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.34834	(0.03668)	1264.463	0.68897
AVERAGE HEAD ON TOP OF LAYER 3	$\boxed{0.001}$	(0.000)		
	Avg. head = 0.001" < 0.3", the biplanar geocomposite thickness			
LATERAL DRAINAGE COLLECTED FROM LAYER 4	0.34834	(0.03668)	$\boxed{1264.461}$	0.68897
			Avg. Annual Q from Secondary Syste	
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.00000	(0.00000)	0.002	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	$\boxed{0.000}$	(0.000)		
	Avg head = 0.000" < 0.3", the triplanar geocomposite thickness			
CHANGE IN WATER STORAGE	-0.015	(0.4808)	-53.67	-0.029

****

4/
Initial
L=45.6'
S=2. %

□
****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	5.91	21453.299
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	2.75817	$\boxed{10012.14840}$ ↳ Peak Q from Primary System
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.008111	29.44253
AVERAGE HEAD ON TOP OF LAYER 3	0.057	
MAXIMUM HEAD ON TOP OF LAYER 3	0.110" < 0.3" Primary System 0.3" = biplanar geocomposite thickness	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	1.6 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.00811	$\boxed{29.44250}$ ↳ Peak Q from Secondary System
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.000000	0.00003
AVERAGE HEAD ON TOP OF LAYER 5	0.001	
MAXIMUM HEAD ON TOP OF LAYER 5	0.000" < 0.3" Secondary System 0.3" = triplanar geocomposite thickness	
LOCATION OF MAXIMUM HEAD IN LAYER 4 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3979
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0580

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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□
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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)

101
Initial
L = 45.6'
S = 2.19%

-----	--------	---------
1	4.3257	0.1802
2	0.0032	0.0105
3	0.0000	0.0000
4	0.0030	0.0100
5	0.0000	0.0000
6	2.5140	0.4190
SNOW WATER	0.000	

****
****

HELP Model - Initial Waste Placement

$L = 67\ ft$

$S = 3.13\ \%$

14
Initial
L=67'
S=3.13%


```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**              HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                  **
**              DEVELOPED BY ENVIRONMENTAL LABORATORY                       **
**              USAE WATERWAYS EXPERIMENT STATION                           **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY             **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:      P:\HELP\HARDEE.D4
TEMPERATURE DATA FILE:        p:\help\HARDEE.D7
SOLAR RADIATION DATA FILE:    p:\help\HARDEE.D13
EVAPOTRANSPIRATION DATA:      p:\help\HARDEE.D11
SOIL AND DESIGN DATA FILE:    p:\help\HARDEE3.D10
OUTPUT DATA FILE:             p:\help\HARDEE23.OUT


TIME:  14:44      DATE:   2/ 5/2004


******************************************************************************

     TITLE:  Hardee County LF Expansion-Case ~~2~~ 1: Initial Waste Placement

******************************************************************************
```

Slope Length = 67 ft.
Slope = 3.13 %

```
     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
            COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                               LAYER  1 - Drainage Sand
                               --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                        MATERIAL TEXTURE NUMBER  5
          THICKNESS                   =     24.00   INCHES = 2 ft.
          POROSITY                    =      0.4570 VOL/VOL
          FIELD CAPACITY              =      0.1310 VOL/VOL
          WILTING POINT               =      0.0580 VOL/VOL
          INITIAL SOIL WATER CONTENT  =      0.1987 VOL/VOL
          EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
               FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

Primary System

```
                               LAYER  2 - Biplanar Geocomposite
                               --------
```

13/
Initial
L=67'
S=3.13%

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.30	INCHES = 300 mils
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0151	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	17.7000008000	CM/SEC
SLOPE	=	3.13	PERCENT
DRAINAGE LENGTH	=	67.0	FEET

Sheet 3 of Attachment H-5
Sheet 3 of Attachment H-5

LAYER 3 – Textured Liner

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES = 60 mils
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

Secondary System
LAYER 4 – Triplanar Geocomposite

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.30	INCHES = 300 mils
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	26.2000008000	CM/SEC
SLOPE	=	3.13	PERCENT
DRAINAGE LENGTH	=	67.0	FEET

Sheet 4 of Attachment H-5

LAYER 5 – Textured Liner

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES = 60 mils
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE

141
Initial
L=67'
S=3.13%

FML PLACEMENT QUALITY = 3 - GOOD

LAYER 6 - Clay

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 22

THICKNESS	=	6.00 INCHES = 0.5 ft.
POROSITY	=	0.4190 VOL/VOL
FIELD CAPACITY	=	0.3070 VOL/VOL
WILTING POINT	=	0.1800 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4190 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.189999992000E-04 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	74.00	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	0.447	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.742	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.348	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	7.290	INCHES
TOTAL INITIAL WATER	=	7.290	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
TAMPA FLORIDA

STATION LATITUDE	=	24.57	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	0	
END OF GROWING SEASON (JULIAN DATE)	=	367	
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	72.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	78.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA

15/
Initial
L=67'
S=? %

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
2.18	2.66	3.48	3.34	2.77	7.92
7.60	8.43	6.12	3.44	2.57	2.14

Site Specific Rainfall Attachment H-4

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.80	60.80	66.20	71.60	77.10	80.90
82.20	82.20	80.90	74.50	66.70	61.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR TAMPA FLORIDA AND STATION LATITUDE = 27.58 DEGREES

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	50.56	(7.101)	183529.2	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
EVAPOTRANSPIRATION	28.969	(3.0315)	105156.41	57.297
LATERAL DRAINAGE COLLECTED FROM LAYER 2	21.25330	(5.21457)	77149.484	42.03663
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.35202	(0.03665)	1277.815	0.69625
AVERAGE HEAD ON TOP OF LAYER 3	0.001	(0.000)		
LATERAL DRAINAGE COLLECTED FROM LAYER 4	0.35201	(0.03665)	1277.813	0.69625
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.00000	(0.00000)	0.002	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	0.000	(0.000)		
CHANGE IN WATER STORAGE	-0.015	(0.4713)	-54.54	-0.030

Avg. Annual Q from Primary System

Avg. head = 0.002" < 0.3", the biplanar geocomposite thickness

Avg. Annual Q from Secondary Syst

Avg. head = 0.000" < 0.3", the triplanar geocomposite thickness

****

161
Initial
L=67'
S=3.13%

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	5.91	21453.299
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	2.75406	$\boxed{9997.23926}$ Peak Q from Primary System
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.008119	29.47361
AVERAGE HEAD ON TOP OF LAYER 3	0.059	
MAXIMUM HEAD ON TOP OF LAYER 3	0.115 " < 0.3" Primary System	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	0.3" = biplanar geocomposite thickness 1.3 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.00812	$\boxed{29.47357}$ Peak Q from Secondary System
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.000000	0.00004
AVERAGE HEAD ON TOP OF LAYER 5	0.001	
MAXIMUM HEAD ON TOP OF LAYER 5	0.000" < 0.3" Secondary System	
LOCATION OF MAXIMUM HEAD IN LAYER 4 (DISTANCE FROM DRAIN)	0.3" = triplanar geocomposite thickness 0.0 FEET	
SNOW WATER	0.00	0.0000

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4037
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0580

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

****

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)

171
Initial
L=67'
S=3.1 m.

-----	--------	---------
1	4.3192	0.1800
2	0.0033	0.0109
3	0.0000	0.0000
4	0.0030	0.0100
5	0.0000	0.0000
6	2.5140	0.4190
SNOW WATER	0.000	

****
****

HELP Model - Initial Waste Placement

L= 63.7 ft

S = 2.81 %

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**              HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                  **
**              DEVELOPED BY ENVIRONMENTAL LABORATORY                       **
**              USAE WATERWAYS EXPERIMENT STATION                           **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY             **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:      P:\HELP\HARDEE.D4
TEMPERATURE DATA FILE:        p:\help\HARDEE.D7
SOLAR RADIATION DATA FILE:    p:\help\HARDEE.D13
EVAPOTRANSPIRATION DATA:      p:\help\HARDEE.D11
SOIL AND DESIGN DATA FILE:    p:\help\HARDEE3.D10
OUTPUT DATA FILE:             p:\help\HARDEE21.OUT


TIME:  14:36      DATE:   2/ 5/2004


******************************************************************************

     TITLE:  Hardee County LF Expansion-Case 1: Initial Waste Placement

******************************************************************************
```

Slope Length = 63.7'
Slope = 2.81 %

```
     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.
```

LAYER 1 – Drainage Sand

```
                   TYPE 1 - VERTICAL PERCOLATION LAYER
                       MATERIAL TEXTURE NUMBER   5
        THICKNESS                      =      24.00    INCHES = 2 ft.
        POROSITY                       =       0.4570 VOL/VOL
        FIELD CAPACITY                 =       0.1310 VOL/VOL
        WILTING POINT                  =       0.0580 VOL/VOL
        INITIAL SOIL WATER CONTENT     =       0.1986 VOL/VOL
        EFFECTIVE SAT. HYD. COND.      =   0.100000005000E-02 CM/SEC
      NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
             FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

Primary System
LAYER 2 – Biplanar Geocomposite

201
Initial
L: 63.7'
S: 2.81%

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.30	INCHES = 300 mils
POROSITY	=	0.8500	VOL/VOL ↳ Sheet 3 of Attachment H-5
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0154	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	17.7000008000	CM/SEC
SLOPE	=	2.81	PERCENT ↳ Sheet 3 of Attachment H-5
DRAINAGE LENGTH	=	63.7	FEET

LAYER 3 – Textured Liner

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES = 60 mils
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

Secondary System
LAYER 4 – Triplanar Geocomposite

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.30	INCHES = 300 mils
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	26.2000008000	CM/SEC
SLOPE	=	2.81	PERCENT
DRAINAGE LENGTH	=	63.7	FEET

Sheet 4 of Attachment H-5

LAYER 5 – Textured Liner

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES = 60 mils
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE

21/
Initial
L=63.7'
S=2 %


```
FML PLACEMENT QUALITY          =  3 - GOOD
```

LAYER 6 — Clay

```
                TYPE 3 - BARRIER SOIL LINER
                MATERIAL TEXTURE NUMBER  22
THICKNESS                    =       6.00    INCHES = 0.5 ft.
POROSITY                     =       0.4190  VOL/VOL
FIELD CAPACITY               =       0.3070  VOL/VOL
WILTING POINT                =       0.1800  VOL/VOL
INITIAL SOIL WATER CONTENT   =       0.4190  VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.189999992000E-04 CM/SEC
```

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

```
NOTE:  SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER                =     74.00
FRACTION OF AREA ALLOWING RUNOFF       =      0.0     PERCENT
AREA PROJECTED ON HORIZONTAL PLANE     =      1.000   ACRES
EVAPORATIVE ZONE DEPTH                 =      6.0     INCHES
INITIAL WATER IN EVAPORATIVE ZONE      =      0.444   INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE     =      2.742   INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE     =      0.348   INCHES
INITIAL SNOW WATER                     =      0.000   INCHES
INITIAL WATER IN LAYER MATERIALS       =      7.289   INCHES
TOTAL INITIAL WATER                    =      7.289   INCHES
TOTAL SUBSURFACE INFLOW                =      0.00    INCHES/YEAR
```

EVAPOTRANSPIRATION AND WEATHER DATA

```
NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
          TAMPA                      FLORIDA

    STATION LATITUDE                          =  24.57 DEGREES
    MAXIMUM LEAF AREA INDEX                   =   1.00
    START OF GROWING SEASON (JULIAN DATE)     =     0
    END OF GROWING SEASON (JULIAN DATE)       =   367
    EVAPORATIVE ZONE DEPTH                    =   6.0  INCHES
    AVERAGE ANNUAL WIND SPEED                 =   8.60 MPH
    AVERAGE 1ST QUARTER RELATIVE HUMIDITY     =  74.00 %
    AVERAGE 2ND QUARTER RELATIVE HUMIDITY     =  72.00 %
    AVERAGE 3RD QUARTER RELATIVE HUMIDITY     =  78.00 %
    AVERAGE 4TH QUARTER RELATIVE HUMIDITY     =  76.00 %

NOTE:  PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
          COEFFICIENTS FOR    TAMPA                 FLORIDA
```

2d1
Initial
L = 63.7'
S = 2.81%

HARDEE21.OUT

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
2.18	2.66	3.48	3.34	2.77	7.92
7.60	8.43	6.12	3.44	2.57	2.14

Site Specific Rainfall Attachment H-4

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.80	60.80	66.20	71.60	77.10	80.90
82.20	82.20	80.90	74.50	66.70	61.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA
AND STATION LATITUDE = 27.58 DEGREES

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	50.56	(7.101)	183529.2	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
EVAPOTRANSPIRATION	29.069	(3.0254)	105518.95	57.494
LATERAL DRAINAGE COLLECTED FROM LAYER 2	21.14428	(5.24017)	$\boxed{76753.727}$ Avg. Annual Q from Primary System	41.82100
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.36084	(0.03854)	1309.842	0.71370
AVERAGE HEAD ON TOP OF LAYER 3	$\boxed{0.001}$ Avg. head = 0.001" < 0.3", the biplanar geocomposite thickness	(0.000)		
LATERAL DRAINAGE COLLECTED FROM LAYER 4	0.36084	(0.03854)	$\boxed{1309.840}$ Avg. Annual Q from Secondary System	0.71370
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.00000	(0.00000)	0.002	0.00000
AVERAGE HEAD ON TOP OF LAYER 5	$\boxed{0.000}$ Avg. head = 0.000" < 0.3", the triplanar geocomposite thickness	(0.000)		
CHANGE IN WATER STORAGE	-0.015	(0.4705)	-53.35	-0.029

****

****

23/
Initial
L=63.7'
S=.019

HARDEE21.OUT

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	5.91	21453.299
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	2.69532	$\boxed{9784.00781}$ Peak Q from Primary System
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.008306	30.15022
AVERAGE HEAD ON TOP OF LAYER 3	0.061	
MAXIMUM HEAD ON TOP OF LAYER 3	0.119" < 0.3" Primary System 0.3" = biplanar geocomposite thickness	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	1.5 FEET	
DRAINAGE COLLECTED FROM LAYER 4	0.00831	$\boxed{30.15018}$ Peak Q from Secondary System
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.000000	0.00004
AVERAGE HEAD ON TOP OF LAYER 5	0.001	
MAXIMUM HEAD ON TOP OF LAYER 5	0.000" < 0.3" Secondary System 0.3" = triplanar geocomposite thickness	
LOCATION OF MAXIMUM HEAD IN LAYER 4 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4099
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0580

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

****

0
****

FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	4.3276	0.1803
2	0.0034	0.0114
3	0.0000	0.0000

241/
Initial
L=63.7'
S=2.81%

4	0.0030	0.0100
5	0.0000	0.0000
6	2.5140	0.4190
SNOW WATER	0.000	

****
****

HELP Model - 10 ft Fill Height

L = 47.2 ft.

S = 2.02 %

10' Waste
L= 47.2'
S= 2.02%

```
□
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**            HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                 **
**              HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                  **
**               DEVELOPED BY ENVIRONMENTAL LABORATORY                      **
**                 USAE WATERWAYS EXPERIMENT STATION                        **
**           FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:     P:\HELP\HARDEE.D4
TEMPERATURE DATA FILE:       P:\HELP\HARDEE.D7
SOLAR RADIATION DATA FILE:   P:\HELP\HARDEE.D13
EVAPOTRANSPIRATION DATA:     P:\HELP\HARDEE.D11
SOIL AND DESIGN DATA FILE:   P:\HELP\HARDEE.D10
OUTPUT DATA FILE:            P:\HELP\HARDEE.OUT


TIME:  18:12     DATE:  11/ 9/2004


******************************************************************************

     TITLE:  Hardee County LF Expansion-Case 2: 10 ft of Waste

******************************************************************************
```

Slope Length = 47.2'
Slope = 2.02%

```
     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                             LAYER  1 - Daily Cover (Sand)
                             --------

                      TYPE 1 - VERTICAL PERCOLATION LAYER
                          MATERIAL TEXTURE NUMBER   5
          THICKNESS                 =        6.00   INCHES = 0.5 ft.
          POROSITY                  =        0.4570 VOL/VOL
          FIELD CAPACITY            =        0.1310 VOL/VOL
          WILTING POINT             =        0.0580 VOL/VOL
          INITIAL SOIL WATER CONTENT =       0.0739 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  =   0.100000005000E-02 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
                FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                             LAYER  2 - Waste
                             --------
```

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION

NOV 19 2004

SOUTHWEST DISTRICT
TAMPA

10' Waste
L= 47.2'
S= 2.02 %


```
            TYPE 1 - VERTICAL PERCOLATION LAYER
                MATERIAL TEXTURE NUMBER  19
THICKNESS                    =      24.00   INCHES
POROSITY                     =       0.1680 VOL/VOL
FIELD CAPACITY               =       0.0730 VOL/VOL
WILTING POINT                =       0.0190 VOL/VOL
INITIAL SOIL WATER CONTENT   =       0.0730 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   0.100000005000E-02 CM/SEC
```

= 2 ft.

```
                      LAYER  3
                      --------
```

- Waste

```
            TYPE 1 - VERTICAL PERCOLATION LAYER
                MATERIAL TEXTURE NUMBER  19
THICKNESS                    =      48.00   INCHES
POROSITY                     =       0.1680 VOL/VOL
FIELD CAPACITY               =       0.0730 VOL/VOL
WILTING POINT                =       0.0190 VOL/VOL
INITIAL SOIL WATER CONTENT   =       0.0730 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   0.100000005000E-02 CM/SEC
```

= 4 ft.

```
                      LAYER  4
                      --------
```

- Waste

```
            TYPE 1 - VERTICAL PERCOLATION LAYER
                MATERIAL TEXTURE NUMBER  19
THICKNESS                    =      48.00   INCHES
POROSITY                     =       0.1680 VOL/VOL
FIELD CAPACITY               =       0.0730 VOL/VOL
WILTING POINT                =       0.0190 VOL/VOL
INITIAL SOIL WATER CONTENT   =       0.0730 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   0.100000005000E-02 CM/SEC
```

= 4 ft.

```
                      LAYER  5
                      --------
```

- Drainage Sand

```
            TYPE 1 - VERTICAL PERCOLATION LAYER
                MATERIAL TEXTURE NUMBER   5
THICKNESS                    =      24.00   INCHES
POROSITY                     =       0.4570 VOL/VOL
FIELD CAPACITY               =       0.1310 VOL/VOL
WILTING POINT                =       0.0580 VOL/VOL
INITIAL SOIL WATER CONTENT   =       0.2584 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   0.100000005000E-02 CM/SEC
```

= 2 ft.

Primary System

```
                      LAYER  6
                      --------
```

- Biplanar Geocomposite

```
             TYPE 2 - LATERAL DRAINAGE LAYER
                MATERIAL TEXTURE NUMBER   0
```


FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

10' Waste
L = 47.2'
S = 2.02%

10ft_202slope

THICKNESS	=	0.29	INCHES = 290 mils
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	14.1000004000	CM/SEC
SLOPE	=	2.02	PERCENT
DRAINAGE LENGTH	=	47.2	FEET

Sheet 5 of Attachment H-5

LAYER 7 - Textured Liner

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES = 60 mils
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

Secondary System

LAYER 8 - Triplanar Geocomposite

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.25	INCHES = 250 mils
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	21.8999996000	CM/SEC
SLOPE	=	2.02	PERCENT
DRAINAGE LENGTH	=	47.2	FEET

Sheet 6 of Attachment H-5

LAYER 9 - Textured Liner

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES = 60 mils
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION

NOV 19 2004

SOUTHWEST DISTRICT
TAMPA

10' waste
L= 47.2'
S= 2.02%

LAYER 10 - Clay

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 22

THICKNESS	=	6.00 INCHES = 0.5 ft.
POROSITY	=	0.4190 VOL/VOL
FIELD CAPACITY	=	0.3070 VOL/VOL
WILTING POINT	=	0.1800 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4190 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.189999992000E-04 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	74.00	
FRACTION OF AREA ALLOWING RUNOFF	=	40.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	0.444	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.742	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.348	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	17.924	INCHES
TOTAL INITIAL WATER	=	17.924	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
TAMPA FLORIDA

STATION LATITUDE	=	24.57 DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00
START OF GROWING SEASON (JULIAN DATE)	=	0
END OF GROWING SEASON (JULIAN DATE)	=	367
EVAPORATIVE ZONE DEPTH	=	6.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.60 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	72.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	78.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00 %

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

Site Specific Rainfall
Attachment H-4

10' Waste
L= 47.2'
S= 2.02 %

2.18	2.66	3.48	3.34	2.77	7.92
7.60	8.43	6.12	3.44	2.57	2.14

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.80	60.80	66.20	71.60	77.10	80.90
82.20	82.20	80.90	74.50	66.70	61.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA
AND STATION LATITUDE = 27.58 DEGREES

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES	CU. FEET	PERCENT
PRECIPITATION	50.56 (7.101)	183529.2	100.00
RUNOFF	0.389 (0.3429)	1412.92	0.770
EVAPOTRANSPIRATION	29.559 (2.8583)	107298.53	58.464
LATERAL DRAINAGE COLLECTED FROM LAYER 6	20.23285 (5.11981)	73445.227	40.01828
		Avg. Annual Q from Primary System.	
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.41423 (0.04840)	1503.660	0.81930
AVERAGE HEAD ON TOP OF LAYER 7	0.002 (0.000)		
	Avg. head = 0.002" < 0.29", the reduced biplanar geocomposite thickness.		
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.41423 (0.04840)	1503.656	0.81930
		Avg. Annual Q from Secondary System.	
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00000 (0.00000)	0.003	0.00000
AVERAGE HEAD ON TOP OF LAYER 9	0.000 (0.000)		
	Avg. head = 0.000" < 0.25", the reduced triplanar geocomposite thickness.		
CHANGE IN WATER STORAGE	-0.036 (0.5955)	-131.18	-0.071

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	5.91	21453.299
RUNOFF	0.734	2663.2905

..ORIDA DEPARTMENT OF
..VIRONMENTAL PROTECTION
NOV 19 2004
..WEST DISTRICT
TAMPA

10' Waste
L= 47.2'
S= 2.02 %

DRAINAGE COLLECTED FROM LAYER 6	1.81023	$\boxed{6571.13281}$ Peak Q from Primary System
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.008316	30.18529
AVERAGE HEAD ON TOP OF LAYER 7	0.053	
MAXIMUM HEAD ON TOP OF LAYER 7	0.102 < 0.29" Primary System 0.29 = reduced biplanar geocomposite thickness	
LOCATION OF MAXIMUM HEAD IN LAYER 6 (DISTANCE FROM DRAIN)	1.6 FEET	
DRAINAGE COLLECTED FROM LAYER 8	0.00832	$\boxed{30.18524}$ Peak Q from Secondary System
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000000	0.00005
AVERAGE HEAD ON TOP OF LAYER 9	0.001	
MAXIMUM HEAD ON TOP OF LAYER 9	0.000 < 0.25" Secondary System 0.25" = reduced triplanar geocomposite thickness.	
LOCATION OF MAXIMUM HEAD IN LAYER 8 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4158
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0580

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

****

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

10' Waste
L=77.3'
S=2.14%

HARDEE22

```
********************************************************************************
********************************************************************************
**                                                                            **
**                                                                            **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                 **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                  **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                      **
**                   USAE WATERWAYS EXPERIMENT STATION                        **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                **
**                                                                            **
**                                                                            **
********************************************************************************
********************************************************************************
```

```
PRECIPITATION DATA FILE:      P:\HELP\HARDEE.D4
TEMPERATURE DATA FILE:        P:\HELP\HARDEE.D7
SOLAR RADIATION DATA FILE:    P:\HELP\HARDEE.D13
EVAPOTRANSPIRATION DATA:      P:\HELP\HARDEE.D11
SOIL AND DESIGN DATA FILE:    P:\HELP\HARDEE.D10
OUTPUT DATA FILE:             P:\HELP\HARDEE22.OUT
```

TIME: 18:16   DATE: 11/ 9/2004

```
********************************************************************************
```

TITLE: Hardee County LF Expansion-Case 2: 10 ft of Waste

```
********************************************************************************
```

Slope Length = 77.3'
Slope = 2.14%

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1 - Daily Cover (Sand)

```
              TYPE 1 - VERTICAL PERCOLATION LAYER
                 MATERIAL TEXTURE NUMBER   5
THICKNESS                   =        6.00    INCHES = 0.5 ft.
POROSITY                    =        0.4570 VOL/VOL
FIELD CAPACITY              =        0.1310 VOL/VOL
WILTING POINT               =        0.0580 VOL/VOL
INITIAL SOIL WATER CONTENT  =        0.0741 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   0.100000005000E-02 CM/SEC
NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
       FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

LAYER 2 - Waste

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004

10' waste
L = 77.3'
S = 2.14%

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 19

THICKNESS	=	24.00	INCHES = 2 ft.
POROSITY	=	0.1680	VOL/VOL
FIELD CAPACITY	=	0.0730	VOL/VOL
WILTING POINT	=	0.0190	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0730	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 3 - Waste

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 19

THICKNESS	=	48.00	INCHES = 4 ft.
POROSITY	=	0.1680	VOL/VOL
FIELD CAPACITY	=	0.0730	VOL/VOL
WILTING POINT	=	0.0190	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0730	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 4 - Waste

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 19

THICKNESS	=	48.00	INCHES = 4 ft.
POROSITY	=	0.1680	VOL/VOL
FIELD CAPACITY	=	0.0730	VOL/VOL
WILTING POINT	=	0.0190	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0730	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

LAYER 5 - Drainage Sand

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 5

THICKNESS	=	24.00	INCHES = 2 ft.
POROSITY	=	0.4570	VOL/VOL
FIELD CAPACITY	=	0.1310	VOL/VOL
WILTING POINT	=	0.0580	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2595	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02	CM/SEC

Primary System
LAYER 6 - Biplanar Geocomposite

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

10' Waste
L= 77.3'
S= 2.14 %

HARDEE22

THICKNESS	=	0.29	INCHES = 290 mils
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	14.1000004000	CM/SEC
SLOPE	=	2.14	PERCENT
DRAINAGE LENGTH	=	77.3	FEET

Sheet 5 of Attachment H-6

LAYER 7 - Textured Liner

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES = 60 mils
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

Secondary System

LAYER 8 - Triplanar Geocomposite

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.25	INCHES = 250 mils
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0100	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	21.8999996000	CM/SEC
SLOPE	=	2.14	PERCENT
DRAINAGE LENGTH	=	77.3	FEET

Sheet 6 of Attachment H-5

LAYER 9 - Textured Liner

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES = 60 mils
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
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SOUTHWEST DISTRICT
TAMPA

10' Waste
L= 77.3'
S= 2.14%

LAYER 10 – Clay

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 22

THICKNESS	=	6.00	INCHES - 0.5 ft.
POROSITY	=	0.4190	VOL/VOL
FIELD CAPACITY	=	0.3070	VOL/VOL
WILTING POINT	=	0.1800	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4190	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.189999992000E-04	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	74.00	
FRACTION OF AREA ALLOWING RUNOFF	=	40.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	0.444	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.742	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.348	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	17.952	INCHES
TOTAL INITIAL WATER	=	17.952	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
TAMPA FLORIDA

STATION LATITUDE	=	24.57	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	0	
END OF GROWING SEASON (JULIAN DATE)	=	367	
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	72.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	78.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

FLORIDA DEPARTMENT OF
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SOUTHWEST DISTRICT
TAMPA

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

Site Specific Rainfall
Attachment H-4

10' Waste
L = 77.3'
S = 2.14%

HARDEE22

2.18	2.66	3.48	3.34	2.77	7.92
7.60	8.43	6.12	3.44	2.57	2.14

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.80	60.80	66.20	71.60	77.10	80.90
82.20	82.20	80.90	74.50	66.70	61.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR TAMPA FLORIDA AND STATION LATITUDE = 27.58 DEGREES

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	50.56	(7.101)	183529.2	100.00
RUNOFF	0.384	(0.3438)	1395.33	0.760
EVAPOTRANSPIRATION	30.236	(2.9028)	109755.20	59.803
LATERAL DRAINAGE COLLECTED FROM LAYER 6	19.47468	(5.16018)	70693.094	38.51872
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.50155	(0.06223)	1820.632	0.99201
AVERAGE HEAD ON TOP OF LAYER 7	0.002	(0.001)		
LATERAL DRAINAGE COLLECTED FROM LAYER 8	0.50155	(0.06223)	1820.626	0.99201
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00000	(0.00000)	0.006	0.00000
AVERAGE HEAD ON TOP OF LAYER 9	0.000	(0.000)		
CHANGE IN WATER STORAGE	-0.037	(0.6226)	-135.11	-0.074

Avg. Annual Q from Primary System

Avg. head = 0.002 < 0.29," reduced biplanar geocomposite thickness

Avg. Annual Q from Secondary System

Avg. head = 0.000 < 0.25," reduced triplanar geocomposite thickness.

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	5.91	21453.299
RUNOFF	0.736	2669.936

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTIO
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

10' waste
L= 77.3'
S=2.14%

DRAINAGE COLLECTED FROM LAYER 6	1.83967	$\boxed{6678.01709}$ Peak Q from Primary System
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.010457	37.95993
AVERAGE HEAD ON TOP OF LAYER 7	0.083	
MAXIMUM HEAD ON TOP OF LAYER 7	0.161 < 0.29" Primary System 0.29" = reduced biplanar geocomposite thickness	
LOCATION OF MAXIMUM HEAD IN LAYER 6 (DISTANCE FROM DRAIN)	2.4 FEET	
DRAINAGE COLLECTED FROM LAYER 8	0.01046	$\boxed{37.95984}$ Peak Q from Secondary System
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000000	0.00009
AVERAGE HEAD ON TOP OF LAYER 9	0.002	
MAXIMUM HEAD ON TOP OF LAYER 9	0.001 < 0.25" Secondary System 0.25" = reduced triplanar geocomposite thickness	
LOCATION OF MAXIMUM HEAD IN LAYER 8 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	0.00	0.0000

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4328
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0580

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

****

40' waste
L=77.3'
S=2.14%


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************************************************************************************
************************************************************************************
**                                                                                **
**                                                                                **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                     **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                      **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                         **
**                    USAE WATERWAYS EXPERIMENT STATION                           **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                   **
**                                                                                **
**                                                                                **
************************************************************************************
************************************************************************************
```

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PRECIPITATION DATA FILE:      P:\HELP\HARDEE.D4
TEMPERATURE DATA FILE:        P:\HELP\HARDEE.D7
SOLAR RADIATION DATA FILE:    P:\HELP\HARDEE.D13
EVAPOTRANSPIRATION DATA:      P:\HELP\HARDEE.D11
SOIL AND DESIGN DATA FILE:    P:\HELP\HARDEE40.D10
OUTPUT DATA FILE:             P:\HELP\HARDEE40.OUT
```

TIME: 17:49   DATE: 11/ 9/2004

****

TITLE: Hardee County LF Expansion - Case 2: 40 ft of Waste

****

Slope Length=77.3'
Slope = 2.14%

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1 - Daily Cover (Sand)

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 5

```
THICKNESS                  =      6.00   INCHES = 0.5 ft.
POROSITY                   =      0.4570 VOL/VOL
FIELD CAPACITY             =      0.1310 VOL/VOL
WILTING POINT              =      0.0580 VOL/VOL
INITIAL SOIL WATER CONTENT =      0.0737 VOL/VOL
EFFECTIVE SAT. HYD. COND.  =  0.100000005000E-02 CM/SEC
```
NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 1.80
FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
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SOUTHWEST DISTRICT
TAMPA

LAYER 2 - Waste

40' Waste
L=77.3'
S=2.14%

HARDEE40

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 19

THICKNESS	=	72.00 INCHES = 6 ft.
POROSITY	=	0.1680 VOL/VOL
FIELD CAPACITY	=	0.0730 VOL/VOL
WILTING POINT	=	0.0190 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0730 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

LAYER 3 - Waste

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 19

THICKNESS	=	240.00 INCHES = 20 ft.
POROSITY	=	0.1680 VOL/VOL
FIELD CAPACITY	=	0.0730 VOL/VOL
WILTING POINT	=	0.0190 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0747 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

LAYER 4 - Waste

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 19

THICKNESS	=	120.00 INCHES = 10 ft.
POROSITY	=	0.1680 VOL/VOL
FIELD CAPACITY	=	0.0730 VOL/VOL
WILTING POINT	=	0.0190 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0751 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

LAYER 5 - Waste

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 19

THICKNESS	=	48.00 INCHES = 4 ft.
POROSITY	=	0.1680 VOL/VOL
FIELD CAPACITY	=	0.0730 VOL/VOL
WILTING POINT	=	0.0190 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0730 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

LAYER 6 - Drainage Sand

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 5

40' Waste
L= 77.3'
S= 2.14%

THICKNESS	=	24.00 INCHES = 2 ft.
POROSITY	=	0.4570 VOL/VOL
FIELD CAPACITY	=	0.1310 VOL/VOL
WILTING POINT	=	0.0580 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2337 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

Primary System

LAYER 7 - Biplanar Geocomposite

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.27 INCHES = 270 mils
POROSITY	=	0.8500 VOL/VOL
FIELD CAPACITY	=	0.0100 VOL/VOL
WILTING POINT	=	0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0189 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	6.80000019000 CM/SEC
SLOPE	=	2.14 PERCENT
DRAINAGE LENGTH	=	77.3 FEET

Sheet 5 of Attachment H-5

LAYER 8 - Textured Liner

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES = 60 mils
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	2.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

Secondary System

LAYER 9 - Triplanar Geocomposite

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.25 INCHES = 250 mils
POROSITY	=	0.8500 VOL/VOL
FIELD CAPACITY	=	0.0100 VOL/VOL
WILTING POINT	=	0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	13.3999996000 CM/SEC
SLOPE	=	2.14 PERCENT
DRAINAGE LENGTH	=	77.3 FEET

Sheet 6 of Attachment H-6

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

LAYER 10 - Textured Liner

40' waste
L = 77.3'
S = 2.14%

HARDEE40

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES = 60 mils
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	2.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 11 - Clay

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 22

THICKNESS	=	6.00	INCHES = 0.5 ft.
POROSITY	=	0.4190	VOL/VOL
FIELD CAPACITY	=	0.3070	VOL/VOL
WILTING POINT	=	0.1800	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2554	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.189999992000E-04	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	74.00	
FRACTION OF AREA ALLOWING RUNOFF	=	40.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	0.442	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	2.742	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.348	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	43.292	INCHES
TOTAL INITIAL WATER	=	43.292	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
TAMPA FLORIDA

STATION LATITUDE	=	24.57	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	0	
END OF GROWING SEASON (JULIAN DATE)	=	367	

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

40' waste
L=77.3'
S=2.14%

HARDEE40

EVAPORATIVE ZONE DEPTH	=	6.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.60 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	72.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	78.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
2.18	2.66	3.48	3.34	2.77	7.92
7.60	8.43	6.12	3.44	2.57	2.14

Site Specific Rainfall Attachment H-4

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.80	60.80	66.20	71.60	77.10	80.90
82.20	82.20	80.90	74.50	66.70	61.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR TAMPA FLORIDA AND STATION LATITUDE = 27.58 DEGREES

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	50.56	(7.101)	183529.2	100.00
RUNOFF	0.396	(0.3786)	1436.13	0.783
EVAPOTRANSPIRATION	30.808	(2.9547)	111834.68	60.936
LATERAL DRAINAGE COLLECTED FROM LAYER 7	18.02713	(5.02447)	$\boxed{65438.469}$ Avg. Annual Q from Primary System	35.65562
PERCOLATION/LEAKAGE THROUGH LAYER 8	1.36572	(0.19126)	4957.568	2.70124
AVERAGE HEAD ON TOP OF LAYER 8	$\boxed{0.005}$ Avg. head = 0.005" < 0.270," reduced biplanar geocomposite thickness	(0.001)		
LATERAL DRAINAGE COLLECTED FROM LAYER 9	1.36571	(0.19126)	$\boxed{4957.533}$ Avg. Annual Q from Secondary System	2.70122
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00001	(0.00000)	0.034	0.00002

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

40' waste
L=77.3'
S=2.14%

HARDEE40

AVERAGE HEAD ON TOP OF LAYER 10	$\boxed{0.001}$ (0.000)			
	Avg. head = 0.001 < 0.250" reduced triplanar geocomposite thickness			
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.00993 (0.01464)		36.046	0.01964
CHANGE IN WATER STORAGE	-0.048 (0.7069)		-173.68	-0.095

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

	(INCHES)	(CU. FT.)
PRECIPITATION	5.91	21453.299
RUNOFF	0.794	2883.8835
DRAINAGE COLLECTED FROM LAYER 7	0.79019	$\boxed{2868.40576}$ Peak Q from Primary System
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.019595	71.13161
AVERAGE HEAD ON TOP OF LAYER 8	0.074	
MAXIMUM HEAD ON TOP OF LAYER 8	0.144 < 0.270" Primary System	
	0.270" = reduced biplanar geocomposite thickness	
LOCATION OF MAXIMUM HEAD IN LAYER 7 (DISTANCE FROM DRAIN)	2.2 FEET	
DRAINAGE COLLECTED FROM LAYER 9	0.01960	$\boxed{71.13120}$ Peak Q from Secondary System
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000000	0.00041
AVERAGE HEAD ON TOP OF LAYER 10	0.003	
MAXIMUM HEAD ON TOP OF LAYER 10	0.003 < 0.25" Secondary System	
	0.25 = reduced triplanar geocomposite thickness	
LOCATION OF MAXIMUM HEAD IN LAYER 9 (DISTANCE FROM DRAIN)	0.0 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 11	0.000340	1.23272
SNOW WATER	0.00	0.0000
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4499	
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0580	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

****

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

69.5 ' Waste
L = 77.3'
S = 2.14%

695ft

```
□
****************************************************************************
****************************************************************************
**                                                                        **
**                                                                        **
**             HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE              **
**              HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**               DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                 USAE WATERWAYS EXPERIMENT STATION                      **
**           FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                        **
**                                                                        **
****************************************************************************
****************************************************************************
```

```
PRECIPITATION DATA FILE:      P:\HELP\HARDEE.D4
TEMPERATURE DATA FILE:        P:\HELP\HARDEE.D7
SOLAR RADIATION DATA FILE:    P:\HELP\HARDEE.D13
EVAPOTRANSPIRATION DATA:      P:\HELP\HARDEE.D11
SOIL AND DESIGN DATA FILE:    P:\HELP\HARDEEBI.D10
OUTPUT DATA FILE:             P:\HELP\HARDEEBI.OUT
```

TIME: 17:40   DATE: 11/ 9/2004

```
****************************************************************************

     TITLE:  Hardee County LF Expansion-Case 2: 69.5 ft of Waste

****************************************************************************
```

Slope Length = 77.3'
Slope = 2.14 %

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1 - Waste

```
                TYPE 1 - VERTICAL PERCOLATION LAYER
                 MATERIAL TEXTURE NUMBER  19
     THICKNESS                    =     66.00    INCHES = 5.5 ft.
     POROSITY                     =      0.1680 VOL/VOL
     FIELD CAPACITY               =      0.0730 VOL/VOL
     WILTING POINT                =      0.0190 VOL/VOL
     INITIAL SOIL WATER CONTENT   =      0.0681 VOL/VOL
     EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC
   NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
          FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

LAYER 2 - Waste

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

69.5' Waste
L = 77.3'
S = 2.14%

695ft

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 19

THICKNESS	=	120.00 INCHES = 10 ft.
POROSITY	=	0.1680 VOL/VOL
FIELD CAPACITY	=	0.0730 VOL/VOL
WILTING POINT	=	0.0190 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0735 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

LAYER 3 - Waste

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 19

THICKNESS	=	240.00 INCHES = 20 ft.
POROSITY	=	0.1680 VOL/VOL
FIELD CAPACITY	=	0.0730 VOL/VOL
WILTING POINT	=	0.0190 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0772 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

LAYER 4 - Waste

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 19

THICKNESS	=	240.00 INCHES = 20 ft.
POROSITY	=	0.1680 VOL/VOL
FIELD CAPACITY	=	0.0730 VOL/VOL
WILTING POINT	=	0.0190 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0730 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

LAYER 5 - Waste

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 19

THICKNESS	=	120.00 INCHES = 10 ft.
POROSITY	=	0.1680 VOL/VOL
FIELD CAPACITY	=	0.0730 VOL/VOL
WILTING POINT	=	0.0190 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0730 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

LAYER 6 - Waste

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 19

69.5' Waste
L= 77.3'
S= 2.14%

		695ft
THICKNESS	=	48.00 INCHES = 4 ft.
POROSITY	=	0.1680 VOL/VOL
FIELD CAPACITY	=	0.0730 VOL/VOL
WILTING POINT	=	0.0190 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0730 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

LAYER 7 - Drainage Sand

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 5

THICKNESS	=	24.00 INCHES = 2 ft.
POROSITY	=	0.4570 VOL/VOL
FIELD CAPACITY	=	0.1310 VOL/VOL
WILTING POINT	=	0.0580 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.2626 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000005000E-02 CM/SEC

Primary System
LAYER 8 - Biplanar Geocomposite

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.27 INCHES = 270 mils
POROSITY	=	0.8500 VOL/VOL
FIELD CAPACITY	=	0.0100 VOL/VOL
WILTING POINT	=	0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0501 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	6.80000019000 CM/SEC
SLOPE	=	2.14 PERCENT
DRAINAGE LENGTH	=	77.3 FEET

Sheet 5 of Attachment H-5

LAYER 9 - Textured Liner

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES = 60 mils
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

Secondary System
LAYER 10 - Triplanar Geocomposite

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

69.5' Waste
L= 77.3'
S= 2.14%

695ft

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.25 INCHES = 250 mils
POROSITY	=	0.8500 VOL/VOL
FIELD CAPACITY	=	0.0100 VOL/VOL
WILTING POINT	=	0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT	=	~~0.0100 VOL/VOL~~
EFFECTIVE SAT. HYD. COND.	=	13.3999996000 CM/SEC
SLOPE	=	~~2.14~~ PERCENT
DRAINAGE LENGTH	=	77.3 FEET

Sheet 6 of Attachment H-5

LAYER 11 - Textured Liner

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES = 60 mils
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	1.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD

LAYER 12 - Clay

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 22

THICKNESS	=	6.00 INCHES = 0.5 ft.
POROSITY	=	0.4190 VOL/VOL
FIELD CAPACITY	=	0.3070 VOL/VOL
WILTING POINT	=	0.1800 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4190 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.189999992000E-04 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	74.00	
FRACTION OF AREA ALLOWING RUNOFF	=	40.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	6.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	0.114	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	1.008	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.114	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	70.464	INCHES
TOTAL INITIAL WATER	=	70.464	INCHES

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

69.5' Waste
L=77.3'
S=2.14%

695ft

TOTAL SUBSURFACE INFLOW = 0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
TAMPA FLORIDA

STATION LATITUDE	=	24.57 DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00
START OF GROWING SEASON (JULIAN DATE)	=	0
END OF GROWING SEASON (JULIAN DATE)	=	367
EVAPORATIVE ZONE DEPTH	=	6.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.60 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	74.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	72.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	78.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
2.18	2.66	3.48	3.34	2.77	7.92
7.60	8.43	6.12	3.44	2.57	2.14

Site Specific
Rainfall
Attachment H-4

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
59.80	60.80	66.20	71.60	77.10	80.90
82.20	82.20	80.90	74.50	66.70	61.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR TAMPA FLORIDA
AND STATION LATITUDE = 27.58 DEGREES

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES		CU. FEET	PERCENT
PRECIPITATION	50.56	(7.101)	183529.2	100.00
RUNOFF	0.236	(0.2320)	857.99	0.467
EVAPOTRANSPIRATION	19.891	(2.0973)	72205.16	39.343

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

69.5' waste
L=77.3'
S=2.14%

	695ft			
LATERAL DRAINAGE COLLECTED FROM LAYER 8	29.55989 (5.83389)	107302.398	58.46613	
		Avg. Annual Q from Primary System		
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.93526 (0.10025)	3394.979	1.84983	
AVERAGE HEAD ON TOP OF LAYER 9	0.008 (0.001)			
	Avg. head = 0.008" < 0.27" reduced biplanar geocomposite thickness			
LATERAL DRAINAGE COLLECTED FROM LAYER 10	0.93525 (0.10024)	3394.964	1.84982	
		Avg. Annual Q from Secondary System		
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.00000 (0.00000)	0.016	0.00001	
AVERAGE HEAD ON TOP OF LAYER 11	0.000 (0.000)			
	Avg. head = 0.000" < 0.25" reduced triplanar geocomposite thickness			
CHANGE IN WATER STORAGE	-0.064 (1.2624)	-231.35	-0.126	

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30

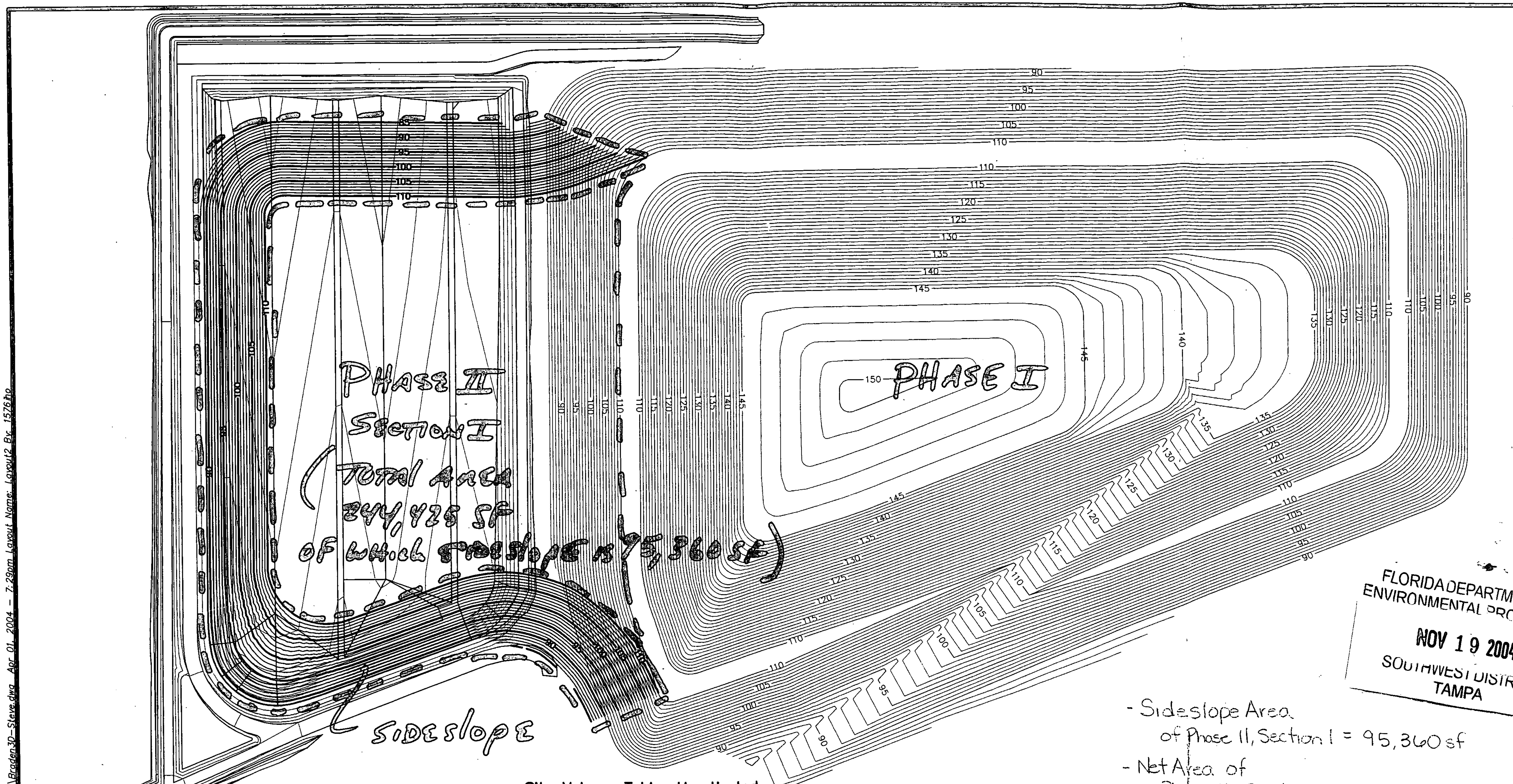
	(INCHES)	(CU. FT.)	
PRECIPITATION	5.91	21453.299	
RUNOFF	0.495	1798.1058	
DRAINAGE COLLECTED FROM LAYER 8	0.71118	2581.57104	Peak Q from Primary System
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.009386	34.07045	
AVERAGE HEAD ON TOP OF LAYER 9	0.067		
MAXIMUM HEAD ON TOP OF LAYER 9	0.130" < 0.27" Primary System 0.27" = reduced biplanar geocomposite thickness		
LOCATION OF MAXIMUM HEAD IN LAYER 8 (DISTANCE FROM DRAIN)	2.1 FEET		
DRAINAGE COLLECTED FROM LAYER 10	0.00939	34.07031	Peak Q from Secondary System
PERCOLATION/LEAKAGE THROUGH LAYER 12	0.000000	0.00013	
AVERAGE HEAD ON TOP OF LAYER 11	0.001		
MAXIMUM HEAD ON TOP OF LAYER 11	0.001" < 0.25" Secondary System 0.25" = reduced triplanar geocomposite thickness		
LOCATION OF MAXIMUM HEAD IN LAYER 10 (DISTANCE FROM DRAIN)	0.0 FEET		
SNOW WATER	0.00	0.0000	
MAXIMUM VEG. SOIL WATER (VOL/VOL)		0.1127	
MINIMUM VEG. SOIL WATER (VOL/VOL)		0.0190	

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

G:\PROJECT\09199033.09\Braden30-Steve.dwg Apr 01, 2004 - 7:29pm Layout Name: Layout2 By: 1576hp



- Sideslope Area of Phase II, Section I = 95,360 sf

- Net Area of Phase II, Section = 244,425 sf

Percent Runoff = $\frac{95,360 \text{ sf}}{244,425 \text{ sf}}$ = 40%

Site Volume Table: Unadjusted

Site	Stratum	Surf1	Surf2	Cut yards	Fill yards	Net yards	Method
P2S1toEL110	exist9903_p2s1tos-p2s1to110			0	172240	172240 (F)	Grid
	existbuild-9-9-03withp2s1top ofsand p2s1-buildoutto110			0	172332	172331 (F)	Composite

SCS ENGINEERS

Figure 1 — Buildout of Phase II Section I to Elevation 110.0

ATTACHMENT H-7

PIPE CRUSHING CALCULATIONS

SCS ENGINEERS

SHEET ________ of ________

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Summary Table Addressing Question No. 12(e) of RAI No. 1 Pipe Crushing Calculations Revised for RAI No. 2 (12/21/04)	LEK	7/22/2004
	CHECKED	DATE
	JHO	5/20/05

10. Rule 62-701.400, F.A.C. Attachment H-7, Pipe crushing calculations. Please provide a summary table for the pipe calculations indicating the condition, pipe size, type of calculation (i.e., buckling, flow capacity, crushing, etc.) and factor of safety.

Description	Fill Height (ft)	Pipe Diameter (inch)	Type of Calculation	Design Value	Calculated Value	Units	Safety Factor*
1.0 ft Fill Height: Construction Groundwater Intercept System	1	8	Flow Capacity**	319.1	93.6	cfm/acre	3
			Buckling	4.14	2.97	psi	>2***
			Compressive Stress	800	25	psi	32
			Bending Strain	4.2	0.103	%	41
1 ft Fill Height: Construction Groundwater Intercept System	1	12	Flow Capacity**	319.1	93.6	cfm/acre	3
			Buckling	7.45	2.97	psi	>2***
			Compressive Stress	800	25	psi	32
			Bending Strain	4.2	0.103	%	41
ft Fill Height: Construction Groundwater Intercept System	76	8	Flow Capacity**	319.1	93.6	cfm/acre	3
			Buckling	42.23	42.15	psi	>2***
			Compressive Stress	800	232	psi	3
			Bending Strain	4.2	2.289	%	2

* Safety Factor = Design Value/Calculated Value

** The design value for flow capacity is obtained from the peak flow rate for an open cell derived from the HELP model. The peak flow rate of 93.6 ft3/min (700 gpm) was used to determine the design value for the perforated flow capacity per acre entering the groundwater intercept system.

$\frac{700 \text{ gal}}{\text{min}} \cdot \frac{1 \text{ ft}^3}{7.4805 \text{ gal}} \Rightarrow 93.6 \frac{\text{ft}^3}{\text{min}}$

***

As shown on Sheet 5 of the pipe crushing calculations, a factor of safety of two is already input into the buckling equation. This factor of safety value and the equations used in the calculations are recommended by the pipe manufacturer. The allowable constrained buckling pressure is the buckling pressure that the pipe can accommodate. The load exerted on the pipe, accounting for the pipe perforations, results in an effective pressure exerted on the pipe; the allowable constrained buckling pressure that the pipe can accommodate must be greater than the effective pressure to prevent buckling.

Allowable Constrained Buckling Pressure = Design Value
Effective Pressure = Calculated Value

D.E.P.
MAY 23 2005
Southwest District Tampa

JOSEPH M. O'NEILL
LICENSE No. 62049
STATE OF FLORIDA
PROFESSIONAL ENGINEER

SCS ENGINEERS

SHEET 1 of 1

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Summary Table Addressing Question No. 10 of RAI No. 1 Pipe Crushing Calculations Revised for RAI No. 2 (12/21/04)	LEK	7/22/2004
	CHECKED	DATE
	Jtto	5/20/05

10. Rule 62-701.400, F.A.C. Attachment H-7, Pipe crushing calculations. Please provide a summary table for the pipe calculations indicating the condition, pipe size, type of calculation (i.e., buckling, flow capacity, crushing, etc.) and factor of safety.

Description	Fill Height (ft)	Pipe Diameter (inch)	Type of Calculation	Design Value	Calculated Value	Units	Safety Factor*
0.5 ft Fill Height: Construction Leachate Collection System	0.5	8	Flow Capacity**	319.1	2.6	cfm/acre	123
			Buckling	11.34	2.38	psi	>2***
			Compressive Stress	800	13	psi	62
			Bending Strain	4.2	0.129	%	33
2 ft Fill Height: Operations Leachate Collection System	2	8	Flow Capacity**	319.1	2.6	cfm/acre	123
			Buckling	18.46	4.52	psi	>2***
			Compressive Stress	800	25	psi	32
			Bending Strain	4.2	0.245	%	17
75 ft Fill Height: Operations Leachate Collection System	75	8	Flow Capacity**	319.1	2.6	cfm/acre	123
			Buckling	42.19	38.54	psi	>2***
			Compressive Stress	800	212	psi	4
			Bending Strain	4.2	2.092	%	2
25 ft Fill Height: Operations 24" Diameter Sideslope Riser Leachate Collection System	25	24	Flow Capacity**	--	--	cfm/acre	N/A
			Buckling	31.11	13.11	psi	>2***
			Compressive Stress	800	111	psi	7
			Bending Strain	4.2	0.676	%	6

* Safety Factor = Design Value/Calculated Value

** The design value for flow capacity is obtained from the peak flow rate for an open cell derived from the HELP model. The peak flow rate of 10,012 ft3/day-acre was used to determine the design value for th perforated flow capacity per acre. Reference Attachment 1 for these calculations.

***

As shown on Sheet 5 of the pipe crushing calculations, a factor of safety of two is already input into the buckling equation. This factor of safety value and the equations used in the calculations are recommended by the pipe manufacturer. The allowable constrained buckling pressure is the buckling pressure that the pipe can accommodate. The load exerted on the pipe, accounting for the pipe perforations, results in an effective pressure exerted on the pipe; the allowable constrained buckling pressure that the pipe can accommodate must be greater than the effective pressure to prevent buckling.

Allowable Constrained Buckling Pressure = Design Value
Effective Pressure = Calculated Value

D.E.P.
MAY 2 3 2005
Southwest District Tampa

JOSEPH N. O'NEILL LICENSE No. 52049 STATE OF FLORIDA PROFESSIONAL ENGINEER

5/2/2005

Attach 1

SCS ENGINEERS				
			SHEET 1	of 1
CLIENT Hardee County	PROJECT Landfill Expansion		JOB NO. 09199033.09	
SUBJECT HELP Model Summary Peak Daily Values	BY: LEK REVISED: LEK		DATE: 2/11/2004 11/9/2004	
	CHECKED JHO		DATE 5/20/05	

Case 1, Waste Depth = 0 feet

	Collection System, k = 17.7 cm/s					Detection System, k = 26.2 cm/s			
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Leachate Collected (gal/day)	Leachate Collected (cf/s)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Leachate Collected (gal/day)
Length = 45.6 ft Slope = 2.19%	0.110	10,012	52.01	74,890	0.116	0.000	29	0.15	217
Length = 67.0 ft Slope = 3.13%	0.115	9,997	51.93	74,778	0.116	0.000	29	0.15	217
Length = 63.7 ft Slope =2.81%	0.119	9,784	50.82	73,184	0.113	0.000	30	0.16	224

Case 2 - Waste Depth = 10 feet

	Collection System, k = 14.1 cm/s					Detection System, k = 21.9 cm/s			
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Leachate Collected (gal/day)	Leachate Collected (cf/s)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Leachate Collected (gal/day)
Length = 47.2 ft Slope = 2.02%	0.102	6,571	34.13	49,151	0.076	0.000	30	0.16	217
Length = 77.3 ft Slope = 2.14%	0.161	6,678	34.69	49,951	0.077	0.001	38	0.20	217

Case 3 - Waste Depth = 40 feet

	Collection System, k = 6.8 cm/s					Detection System, k = 13.4 cm/s			
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Leachate Collected (gal/day)	Leachate Collected (cf/s)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Leachate Collected (gal/day)
Length = 77.3 ft Slope = 2.14%	0.144	2,868	14.90	21,453	0.033	0.003	71	0.37	532

Case 4 - Waste Depth = 69.5 feet

	Collection System, k = 6.8 cm/s					Detection System, k = 13.4 cm/s			
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Leachate Collected (gal/day)	Leachate Collected (cf/s)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Leachate Collected (gal/day
Length = 77.3 ft Slope = 2.14%	0.130	2,582	13.41	19,313	0.030	0.001	34	0.18	254

Note: All flowrates are based on a per acre basis.

→ Initial Waste Placement Peak Flow = 10,012 cf/day/acre

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
MAY 23 2005
SOUTHWEST DISTRICT
TAMPA

f:\project\Hardee\09199033.09SWPermit\RAINo1\HELP\helpsummary\peak

File No. 09199033.09

SUBJECT: Pipe Crushing Calculations, Hardee County Landfill Expansion
Hardee County, Florida

Table of Contents

0.5 ft Fill Height

Construction

SCS ENGINEERS

SHEET 1 of 1

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations Depth above pipe is 1.0 ft for Construction w/ CAT D6R IIXW 8" Diameter Groundwater Intercept Pipe	LEK	4/18/2005
	CHECKED	DATE
	JHO	5/20/05

Verify that perforations in the LCRS are adequate for the peak leachate flow.

Use discharge equation:

$Q = (Cd)(Ao)(2gh)^{0.5}$

C_d = coeffiecient of discharge = 0.6 for short tube discharge with fluid/wall separation; conservative value.

A_o = Area of orifice

g = gravitational acceleration (32.3 ft^2/s)

h = static head (ft)

Assumptions and Givens:

1. No. of acres = 10 acres
2. Length of pipe per acre = 240 ft/acre
3. Perforation diameter = 0.375 inch
4. No. perforations/ft pipe = 6 perforations/ft of pipe length
5. Maximum head over pipe = 1 ft
6. Maximum leachate flow/acre = 700 gpm/acre

1.5597 cfs/acre

93.5829 cfm/acre

D.E.P.

MAY 23 2005

Southwest District Tampa

Solution:

$A_o = 0.25(\Pi)(d)^2 =$ 0.00077 ft^2

1. Flow per orifice, $Q = (Cd)(Ao)(2gh)^{0.5}$ = 0.0037 ft^3/s

2. Flow per ft of pipe = (Q)(# perfs/ft) = 0.02 ft^3/s per ft of pipe
   = 1.33 cfm/ft of pipe

3. Peak flow = (max flow per acre)(no. acres) = 15.597 cfs
   = 935.83 cfm

4. Perforated flow capacity per acre = (flow/ft of pipe) x (length of pipe per acre)
   = 319.1 cfm/acre

↳ Flow Capacity Design Value

Conclusion:

Design capacity exceeds estimated generation

319.1 cfm/acre >>> 93.5829 cfm/acre

Perforations are adequate to handle the maximum leachate flow.

$$FS = \frac{319.1 \text{ cfm/acre}}{93.58 \text{ cfm/acre}} = 3$$

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0.5' Construction
1/8

SCS ENGINEERS

SHEET 1 of 8

CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09
SUBJECT Pipe Crushing Calculations Depth above pipe is 0.5 ft for Construction w/ CAT D6R IIXW 8" Diameter Leachate Collection System	BY LEK CHECKED JHD	DATE 11/7/2003 DATE

Load on Pipe (Overburden)

Prism Loads, $P_E = wH$ Eq'n 7.1 See Source No. 1

w = unit weight
H = depth

	Depth (ft)	Unit Weight (lb/ft^3)	P_E (lb/ft^2)
Cover Soil	0	123.9	0.0
Intermediate Cover	0	123.9	0.0
Waste	0	60.0	0.0
Drainage Sand	0.5	123.9	61.9

TOTAL SOIL PRISM LOAD: 61.9 lb/ft^2

Total Depth = 0.5 ft

Soil Arching, $P_m = C_D w B$

Pm = vertical soil pressure
B = trench width at pipe crown 5 ft

C_D = load coefficient $= \dfrac{1 - e^{-2Ku'HB}}{2Ku'}$ Eq'n 7.3 See Source No. 1

e = natural log base number
K = Rankine earth pressure coefficient = $\tan^2(45-0.5*\phi)$
ϕ = internal soil friction angle = 27 degrees for waste
u' = friction coefficient between backfill and trench sides = tan ϕ

NOTE: The waste unit weight represents the combined unit weight of waste, daily cover, and moisture.

Soil Type	Ku'
Saturated Clay	0.110
Ordinary Clay	0.130
Saturated Top Soil	0.150
Sand and Gravel	0.165
Clean Granular Soil	0.192

	Ku'	C_D	P_m (lb/ft^2)
Cover Soil	0.150	0.00	0
Intermediate Cover	0.165	0.00	0
Waste	0.191	0.00	0
Drainage Sand	0.165	0.08	51

TOTAL SOIL ARCHING LOAD: 50.9 lb/ft^2

LARGEST OVERBURDEN LOAD: 61.9 lb/ft^2

Load on Pipe (Equipment D6R IIXW)

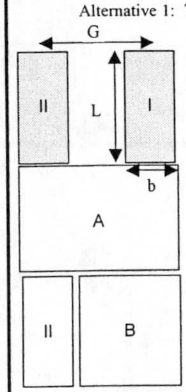
Equipment Weight = 44,000 lbs
Number of Tracks = 2 tracks
Track Load = 44,000 lb * 0.5 = 22,000 lbs per track
Ground Contact Area /track = 23.0 ft^2

Length of Track = L = 110 in
Track Width = b = 30 in
Track Gauge = G = 80 in

Live Load = $q*I_c$

q = track load 957 lb/ft^2
I_c = Influence coefficient

Alternative 1: Track adjacent and parallel to pipe



	b (ft)	L (ft)	z (ft)	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
I	2.50	9.2	0.5	5.00	18.40	-0.001	0.249	0.249
A	9.17	9.2	0.5	18.33	18.40	0.000	0.250	0.250
B	6.67	9.2	0.5	13.33	18.40	0.000	0.250	0.250

Live $Load_1$ = I + II = $q_I(I_I) + q_A(I_A) - q_B(I_B)$ = 238.38 lb/ft^2

$q_I(I_I)$ = 238.35
$q_A(I_A)$ = 239.10
$q_B(I_B)$ = 239.08

Load on Pipe (Equipment) = 238.38 lb/ft^2

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0.5' Construction
2/8

SCS ENGINEERS

SHEET 2 of 8

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 0.5 ft for Construction w/ CAT D6R IIXW 8" Diameter Leachate Collection System		LEK	1/27/2004
		CHECKED JHD	DATE

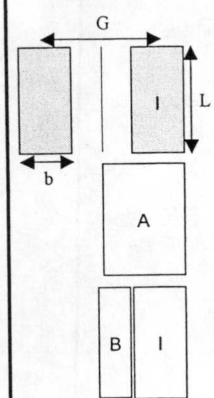
Load on Pipe (Equipment) *Continued*

Live Load = $q*I_c$

q = track load 957 lb/ft^2

I_c = Influence coefficient

Alternative 2: Track stradling and parallel to pipe



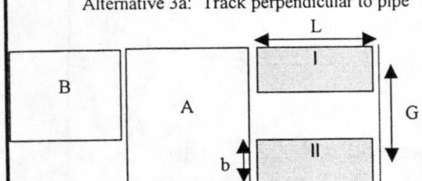
	b	L	z	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
A	4.17	9.4	2	2.08	4.70	-0.010	0.240	0.240
B	2.33	9.4	2	1.17	4.70	-0.034	0.216	0.216

Live Load$_2$ = 2 * (A - B) = 2 * (q_AI_A - q_BI_B) = 47.50 lb/ft^2

$q_A(I_A)$ =	229.98
$q_B(I_B)$ =	206.23

Load on Pipe (Equipment) = 47.50 lb/ft^2

Alternative 3a: Track perpendicular to pipe



	b	L	z	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
I	1.83	9.4	2	0.92	4.70	0.197	0.217	0.197
A	8.33	9.4	2	4.17	4.70	-0.002	0.248	0.248
B	7.42	9.4	2	3.71	4.70	-0.003	0.247	0.247

Live Load$_3$ = I + II = $q_I(I_I)$ + $q_A(I_A)$ - $q_B(I_B)$ = 189.06 lb/ft^4

$q_I(I_I)$ =	188.59
$q_A(I_A)$ =	237.15
$q_B(I_B)$ =	236.68

Load on Pipe (Equipment) = 189.06 lb/ft^2

LARGEST EQUIPEMENT LOAD = 189.06 lb/ft^2

VERTICAL OVERBURDEN LOAD = 61.935 lb/ft^2

VERTICAL EQUIPMENT LOAD = 189.06 lb/ft^2

TOTAL VERTICAL LOAD APPLIED TO PIPE, P_T = 300.31 lb/ft^2 = 2.09 lb/in^2

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SCS ENGINEERS

SHEET 3 of 8

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 0.5 ft for Construction w/ CAT D6R IIXW 8" Diameter Leachate Collection System		LEK	11/7/2003
		CHECKED JHO	DATE

Verify that perforations in the LCRS are adequate for the peak leachate flow.

Discharge Equatic Use discharge equation:

$Q = (Cd)(Ao)(2gh)^{0.5}$

C_d = coeffiecient of discharge = 0.6 for short tube discharge with fluid/wall separation; conservative value.

A_o = Area of orifice

g = gravitational acceleration (32.3 ft^2/s)

h = static head (ft)

Assumptions and Givens:

1. No. acres of landfill expansion = 11 acres
2. Length of pipe per acre = 240 ft/acre
3. Perforation diameter = 0.375 inch
4. No. perforations/ft pipe = 6 perforations/ft of pipe length
5. Maximum head over pipe = 1 ft
6. Maximum leachate flow/acre = 75,383 gal/day — Per HELP model for initial waste placement, Q = 10,078 cf/day/acre.
   0.1166 cfs
   0.0106 cfs/acre
   0.6362 cfm/acre

Solution:

$A_o = 0.25(\Pi)(d)^2 =$ 0.00077 ft^2

1. Flow per orifice, $Q = (Cd)(Ao)(2gh)^{0.5}$ = 0.0037 ft^3/s
2. Flow per ft of pipe = (Q)(# perfs/ft) = 0.02 ft^3/s per ft of pipe
   = 1.33 cfm/ft of pipe
3. Peak flow = (max flow per acre)(no. acres) = 0.117 cfs
   = 7.00 cfm
4. Perforated flow capacity per acre = (flow/ft of pipe) x (length of pipe per acre)
   = 319.1 cfm/acre

Conclusion:

Design capacity exceeds estimated generation

319.1 cfm/acre >>> 0.6362 cfm/acre

Perforations are adequate to handle the maximum leachate flow.

0.5 Construction
4/8

SCS ENGINEERS

SHEET 4 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations Depth above pipe is 0.5 ft for Construction w/ CAT D6R IIXW 8" Diameter Leachate Collection System	LEK	11/7/2003
	CHECKED JHO	DATE

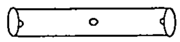
Effective pressure on pipe due to perforations:

$P_{EFF} = \dfrac{P_T \times 12}{(12-L_P)}$ (per EPA SW-870, p. 382)

L_P = Total accumulated length of perforations in one foot of pipe.

Since each perforation is 0.375" diameter and spaced at 6" on center,

L_P = 0.375" x 4 = 1.5 inch



P_T = 2.09 psi

P_{EFF} = 2.4 psi

P_{EFF} = 343 psf

Check actual compressive pressure (S_A) per Driscopipe manual:

S_A = 0.5 x (SDR - 1) x P(eff) = 12 psi

The recommended, long-term compressive strength (Y_s) design value for Driscoplex polyethylene pipe is 800 lb/in^2.

S_A (psi):		Y_s (psi):
12	<	800

Pipe passes wall compressive stress perforation calculations TRUE

0.5' Construction
5/8

SCS ENGINEERS

SHEET 5 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations Depth above pipe is 0.5 ft for Construction w/ CAT D6R IIXW 8" Diameter Leachate Collection System	LEK	11/7/2003
	CHECKED	DATE
	JH	

Constrained Pipe Wall Buckling (for Driscoplex OD controlled pipe)

$P_{WC} = \dfrac{5.65 * \{RB'E' EI*[12(DR-1)^3]^{-1}\}^{0.5}}{N}$ Eq'n 7-30 See Source No. 1

P_{WC} = allowable constrained buckling pressure (lb/in^2)
R = buoyancy reduction factor = 1 - 0.33 * (H'/H)
H' = groundwater height above pipe (ft) | 1 | ft
H = cover above pipe (ft) | 0.5 | ft
B' = elastic support factor =$(1+ 4*e^{-0.065H})^{-1}$
E' = soil reaction modulus (lb/in^2) | 3000 | lb/in^2 for moderate compaction/crushed rock, Table 7-7/Source No. 1
E = elastic modulus (lb/in^2) | 23,000 | lb/in^2 for 50 years at 100°F, Table 5-1/Source No. 1
I = moment of inertia = $t^3/12$ | 0.040 | in^4
D_o = pipe outer diameter (in) | 8.625 | inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
t = pipe wall thickness (in) | 0.784 | inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
DR = pipe dimension ratio = D_o/t | 11 | SDR 11 pipe to be used
D_I = pipe inner diameter = D_o-2t (in) | 7.057 | inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
N = safety factor | 2 | recommended by CPChem manual

	H (ft)	H' (ft)	B'	R	P_{WC} (lb/in^2)
3 ft Cover	0.5	1	0.21	0.34	11.34

P_{WC} = 11.34 lb/in^2
P_{EFF} = 2.38 lb/in^2

Pipe passes contrained wall buckling calculations TRUE

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0.5' Construction
6/8

SCS ENGINEERS

SHEET 6 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations Depth above pipe is 0.5 ft for Construction w/ CAT D6R IIXW 8" Diameter Leachate Collection System	LEK	11/7/2003
	CHECKED JHD	DATE

Constrained Pipe Wall Compressive Stress (for Driscoplex OD controlled pipe)

$$S = \frac{P_T D_o}{228t}$$ Eq'n 7-23 See Source No. 1

S = pipe wall compressive stress (lb/in^2)

P_T = vertical load applied to pipe w/ perfs (lb/ft^2) — 343 lb/ft^2

D_o = pipe outside diameter (in) — 8.625 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)

t = pipe wall thickness (in) — 0.784 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)

$$S = \frac{P_T D_o}{228t} = \boxed{13.1} \text{ lb/in}^2$$

The recommended, long-term compressive strength (Y_s) design value for Driscoplex polyethylene pipe is 800 lb/in^2.

S (psi):		Y_s (psi):
13	<	800

Pipe passes wall compressive stress calculations TRUE

0.5 Construction
7/8

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations	LEK	11/7/2003
Depth above pipe is 0.5 ft for Construction w/ CAT D6R IIXW 8" Diameter Leachate Collection System	CHECKED JHD	DATE

Iowa Formula

$\Delta X = \dfrac{D_L K W_c r^3}{EI + 0.06er^4}$ Eq'n 3.4 See Source No. 3

ΔX = horizontal deflection (in)
D_L = deflection lag factor
K = bedding constant 0.1 typical value
W_c = Marston's load per unit length of pipe (lb/in)
r = mean radius of the pipe (in)
E = modulus of elasticity (lb/in^2)
I = moment of inertia of the pipe wall per unit length (in^3)
e = modulus of passive resistance fo the side fill ($lb/in^2(in)$)

Modified Iowa Formula

$\Delta X = \dfrac{D_L K W_c r_m^3}{EI + 0.06E'r_m^3}$ Eq'n 3.5 See Source No. 3

ΔX = horizontal deflection (in)
D_L = deflection lag factor — 1.5 Marston Load
Typical Value for Marston Load 1.5
Typical Value for Prism Load 1.0
K = bedding constant — 0.1 typical value
P_T = Vertical load on pipe w/ perfs — 2.38 lb/in^2 — 343 lb/ft^2
W_c = Marston's load per unit length of pipe = $P_T * D_o$ (lb/in) — 20.56 lb/in
D_o = pipe outer diameter (in) — 8.625 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
t = pipe wall thickness (in) — 0.784 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
D_I = pipe inner diameter = D_o-2t (in) — 7.057 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
D_m = pipe mean diameter = D_o - 1.06t — 7.79 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
r_m = mean radius of the pipe (in) — 3.90 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
E = modulus of elasticity (lb/in^2) — 23,000 lb/in^2 for 50 years at 100°F, Table 5-1/Source No. 1
I = moment of inertia of the pipe wall per unit length — 0.040 in^4
E' = modulus of soil reaction (See Source No. 1) — 3000 lb/in^2 for moderate compaction and fine grained soils

$\Delta X = \dfrac{D_L K W_c r_m^3}{EI + 0.06E'r_m^3} =$ 0.015764 inch

% Ring Deflection = $(\Delta X/D_m) \times 100$ = 0.202 % Eq'n 7-38 See Source No. 1

Ring Bending Strain

$\varepsilon = \dfrac{f_D \Delta X 2C}{D_M^2}$

ε = wall strain (%)
f_D = deformation shape factor — 6 non-elliptical shape
D_M = mean diameter (in)
C = outer fiber wall centroid = 0.5 (1.06t) — 0.416 Eq'n 7-41 See Source No. 1
ΔX = ring deflection = $\Delta X/D_m$ — 0.002

$\varepsilon = \dfrac{f_D \Delta X 2C}{D_M} =$ 0.129 % Eq'n 7-37 See Source No. 1

The maximum ring bending strain for high performance polyethylene non-pressure pipe is 4.2%

Pipe passes ring bending strain calculations TRUE

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0.5' Construction
8/8

SCS ENGINEERS			
		SHEET 8 of 8	
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Pipe Crushing Calculations Depth above pipe is 0.5 ft for Construction w/ CAT D6R IIXW 8" Diameter Leachate Collection System		BY LEK	DATE 11/7/2003
		CHECKED JHO	DATE

Sources:

1 : CPCHEM, The Performance Pipe Engineering Manual
Book 2, Chapter 7 : Buried Pipe Design
2002

2 : Foundation Design Principles and Practices
Second Edition
Donald P. Coduto
Chapter 7, Section 7.3 : Induced Stresses Beneath Shallow Foundations

3: Buried Pipe Design
A.P. Moser
Chapter 3

2 ft Fill Height

Operations

α Operations
1/8

SCS ENGINEERS

SHEET 1 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations Depth above pipe is 2 ft for Operations w/ CAT D7R Series II 8" Diameter Leachate Collection System	LEK	11/7/2003
	CHECKED JHW	DATE

Load on Pipe (Overburden)

Prism Loads, $P_E = wH$ Eq'n 7.1 See Source No. 1

w = unit weight

H = depth

	Depth (ft)	Unit Weight (lb/ft^3)	P_E (lb/ft^2)
Cover Soil	0	123.9	0.0
Intermediate Cover	0	123.9	0.0
Waste	0	60.0	0.0
Drainage Sand	2	123.9	247.7

TOTAL SOIL PRISM LOAD: 247.7 lb/ft^2

Total Depth = 2 ft

Soil Arching, $P_m = C_D wB$

Pm = vertical soil pressure

B = trench width at pipe crown 5 ft

C_D = load coefficient $= \frac{1 - e^{-2Ku'HB}}{2Ku'}$ Eq'n 7.3 See Source No. 1

e = natural log base number

K = Rankine earth pressure coefficient = $\tan^2(45-0.5*\phi)$

ϕ = internal soil friction angle = 27 degrees for waste

u' = friction coefficient between backfill and trench sides = tan ϕ

NOTE: The waste unit weight represents the combined unit weight of waste, daily cover, and moisture.

Soil Type	Ku'
Saturated Clay	0.110
Ordinary Clay	0.130
Saturated Top Soil	0.150
Sand and Gravel	0.165
Clean Granular Soil	0.192

	Ku'	C_D	P_m (lb/ft^2)
Cover Soil	0.150	0.00	0
Intermediate Cover	0.165	0.00	0
Waste	0.191	0.00	0
Drainage Sand	0.165	0.32	196

TOTAL SOIL ARCHING LOAD: 195.5 lb/ft^2

LARGEST OVERBURDEN LOAD: 247.7 lb/ft^2

Load on Pipe (CAT D7R Series II)

Equipment Weight = 54,582 lbs

Number of Tracks = 2 tracks

Track Load = 55,825 lb * 0.5 = 27,913 lbs per track

Ground Contact Area/track = 17.2 ft^2

Length of Track = L = 113 in

Track Width = b = 22 in

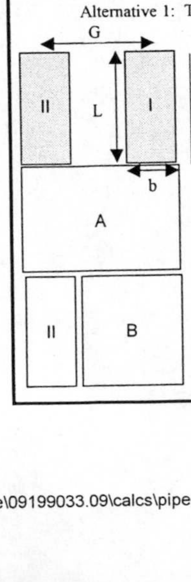
Track Gage = G = 78 in

Live Load = $q*I_c$

q = track load 1620 lb/ft^2

I_c = Influence coefficient

Alternative 1: Track adjacent and parallel to pipe



	b (ft)	L (ft)	z (ft)	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
I	1.83	9.4	2	0.92	4.70	0.197	0.217	0.197
A	8.33	9.4	2	4.17	4.70	-0.002	0.248	0.248
B	6.50	9.4	2	3.25	4.70	-0.003	0.247	0.247

$\text{Live Load}_1 = I + II = q_I(I_I) + q_A(I_A) - q_B(I_B) =$ 321.45 lb/ft^2

$q_I(I_I) =$ 319.33

$q_A(I_A) =$ 401.57

$q_B(I_B) =$ 399.46

Load on Pipe (Equipment) = 321.45 lb/ft^2

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 2 ft for Operations w/ CAT D7R Series II 8" Diameter Leachate Collection System		LEK	1/27/2004
		CHECKED	DATE
		JHB	

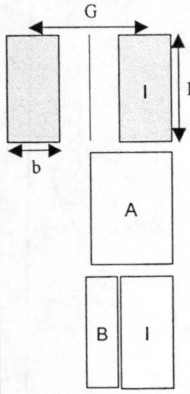
Load on Pipe (Equipment) *Continued*

Live Load = $q*I_c$

q = track load 1620 lb/ft^2

I_c = Influence coefficient

Alternative 2: Track stradling and parallel to pipe



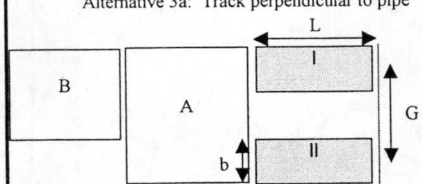
	b	L	z	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
A	4.17	9.4	2	2.08	4.70	-0.010	0.240	0.240
B	2.33	9.4	2	1.17	4.70	-0.034	0.216	0.216

Live Load$_2$ = 2 * (A - B) = 2 * (q_AI_A - q_BI_B) = 80.44 lb/ft^2

$q_A(I_A)$ =	389.43
$q_B(I_B)$ =	349.21

Load on Pipe (Equipment) = 80.44 lb/ft^2

Alternative 3a: Track perpendicular to pipe



	b	L	z	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
I	1.83	9.4	2	0.92	4.70	0.197	0.217	0.197
A	8.33	9.4	2	4.17	4.70	-0.002	0.248	0.248
B	7.42	9.4	2	3.71	4.70	-0.003	0.247	0.247

Live Load$_3$ = I + II = $q_I(I_I)$ + $q_A(I_A)$ - $q_B(I_B)$ = 320.14 lb/ft^4

$q_I(I_I)$ =	319.33
$q_A(I_A)$ =	401.57
$q_B(I_B)$ =	400.77

Load on Pipe (Equipment) = 320.14 lb/ft^2

LARGEST EQUIPEMENT LOAD = 321.45 lb/ft^2

VERTICAL OVERBURDEN LOAD = 247.74 lb/ft^2

VERTICAL EQUIPMENT LOAD = 321.45 lb/ft^2

TOTAL VERTICAL LOAD APPLIED TO PIPE, P_T = 569.19 lb/ft^2 = 3.95 lb/in^2

2' Operations
3/8

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations Depth above pipe is 2 ft for Operations w/ CAT D7R Series II 8" Diameter Leachate Collection System	LEK	11/7/2003
	CHECKED JW	DATE

Verify that perforations in the LCRS are adequate for the peak leachate flow.

Discharge Equatic Use discharge equation:

$Q = (Cd)(Ao)(2gh)^{0.5}$

C_d = coeffiecient of discharge = 0.6 for short tube discharge with fluid/wall separation; conservative value.

A_o = Area of orifice

g = gravitational acceleration (32.3 ft^2/s)

h = static head (ft)

Assumptions and Givens:

1. No. acres of landfill expansion = 11 acres
2. Length of pipe per acre = 240 ft/acre
3. Perforation diameter = 0.375 inch
4. No. perforations/ft pipe = 6 perforations/ft of pipe length
5. Maximum head over pipe = 1 ft
6. Maximum leachate flow/acre = 75,383 gal/day — Per HELP model for initial waste placement, Q = 10,078 cf/day/acre.
   0.1166 cfs
   0.0106 cfs/acre
   0.6362 cfm/acre

Solution:

$A_o = 0.25(\Pi)(d)^2 =$ 0.00077 ft^2

1. Flow per orifice, $Q = (Cd)(Ao)(2gh)^{0.5}$ = 0.0037 ft^3/s
2. Flow per ft of pipe = (Q)(# perfs/ft) = 0.02 ft^3/s per ft of pipe
   = 1.33 cfm/ft of pipe
3. Peak flow = (max flow per acre)(no. acres) = 0.117 cfs
   = 7.00 cfm
4. Perforated flow capacity per acre = (flow/ft of pipe) x (length of pipe per acre)
   = 319.1 cfm/acre

Conclusion:

Design capacity exceeds estimated generation

319.1 cfm/acre >>> 0.6362 cfm/acre

Perforations are adequate to handle the maximum leachate flow.

2'Operations
4/8

SCS ENGINEERS

SHEET 4 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations Depth above pipe is 2 ft for Operations w/ CAT D7R Series II 8" Diameter Leachate Collection System	LEK	11/7/2003
	CHECKED JHD	DATE

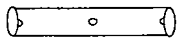
Effective pressure on pipe due to perforations:

$P_{EFF} = \dfrac{P_T \times 12}{(12-L_P)}$ (per EPA SW-870, p. 382)

L_P = Total accumulated length of perforations in one foot of pipe.

Since each perforation is 0.375" diameter and spaced at 6" on center,

$L_P = 0.375" \times 4$ = 1.5 inch



P_T = 3.95 psi

P_{EFF} = 4.5 psi

P_{EFF} = 650 psf

Check actual compressive pressure (S_A) per Driscopipe manual:

S_A = 0.5 x (SDR - 1) x P(eff) = 23 psi

The recommended, long-term compressive strength (Y_s) design value for Driscoplex polyethylene pipe is 800 lb/in^2.

S_A (psi):		Y_s (psi):
23	<	800

Pipe passes wall compressive stress perforation calculations TRUE

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2' Operations
5/8

SCS ENGINEERS

CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09
SUBJECT Pipe Crushing Calculations	BY LEK	DATE 11/7/2003
Depth above pipe is 2 ft for Operations w/ CAT D7R Series II 8" Diameter Leachate Collection System	CHECKED JHO	DATE

Constrained Pipe Wall Buckling (for Driscoplex OD controlled pipe)

$P_{WC} = \dfrac{5.65 * \{RB'E' EI*[12(DR-1)^3]^{-1}\}^{0.5}}{N}$ Eq'n 7-30 See Source No. 1

P_{WC} = allowable constrained buckling pressure (lb/in^2)
R = buoyancy reduction factor = 1 - 0.33 * (H'/H)
H' = groundwater height above pipe (ft) | 1 ft
H = cover above pipe (ft) | 2 ft
B' = elastic support factor =(1+ 4*e$^{-0.065H}$)$^{-1}$
E' = soil reaction modulus (lb/in^2) | 3000 lb/in^2 for moderate compaction/crushed rock, Table 7-7/Source No. 1
E = elastic modulus (lb/in^2) | 23,000 lb/in^2 for 50 years at 100°F, Table 5-1/Source No. 1
I = moment of inertia = t^3/12 | 0.040 in^4
D_o = pipe outer diameter (in) | 8.625 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
t = pipe wall thickness (in) | 0.784 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
DR = pipe dimension ratio = D_o/t | 11 SDR 11 pipe to be used
D_I = pipe inner diameter = D_o-2t (in) | 7.057 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
N = safety factor | 2 recommended by CPChem manual

	H (ft)	H' (ft)	B'	R	P_{WC} (lb/in^2)
3 ft Cover	2	1	0.22	0.84	18.46

P_{WC} = 18.46 lb/in^2
P_{EFF} = 4.52 lb/in^2

Pipe passes contrained wall buckling calculations TRUE

2' Operations
6/8

SCS ENGINEERS

SHEET 6 of 8

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 2 ft for Operations w/ CAT D7R Series II 8" Diameter Leachate Collection System		LEK	11/7/2003
		CHECKED	DATE
		JHD	

Constrained Pipe Wall Compressive Stress (for Driscoplex OD controlled pipe)

$S = \frac{P_T D_o}{228t}$ Eq'n 7-23 See Source No. 1

S = pipe wall compressive stress (lb/in^2)

P_T = vertical load applied to pipe w/ perfs (lb/ft^2)	650	lb/ft^2
D_o = pipe outside diameter (in)	8.625	inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
t = pipe wall thickness (in)	0.784	inches for a 8 inch diameter SDR 11 pipe (Driscopipe)

$S = \frac{P_T D_o}{228t} =$ 24.8 lb/in^2

The recommended, long-term compressive strength (Y_s) design value for Driscoplex polyethylene pipe is 800 lb/in^2.

S (psi):		Y_s (psi):
25	<	800

Pipe passes wall compressive stress calculations TRUE

2' Operations
7|8

SCS ENGINEERS

CLIENT Hardee County	PROJECT Landfill Expansion		JOB NO. 09199033.09
SUBJECT Pipe Crushing Calculations Depth above pipe is 2 ft for Operations w/ CAT D7R Series II 8" Diameter Leachate Collection System		BY LEK	DATE 11/7/2003
		CHECKED JHA	DATE

Iowa Formula

$\Delta X = \dfrac{D_L K W_c r^3}{EI + 0.06er^4}$ Eq'n 3.4 See Source No. 3

ΔX = horizontal deflection (in)
D_L = deflection lag factor
K = bedding constant — 0.1 typical value
W_c = Marston's load per unit length of pipe (lb/in)
r = mean radius of the pipe (in)
E = modulus of elasticity (lb/in^2)
I = moment of inertia of the pipe wall per unit length (in^3)
e = modulus of passive resistance fo the side fill (lb/in^2(in))

Modified Iowa Formula

$\Delta X = \dfrac{D_L K W_c r_m^3}{EI + 0.06E'r_m^3}$ Eq'n 3.5 See Source No. 3

ΔX = horizontal deflection (in)
D_L = deflection lag factor — 1.5 Marston Load
Typical Value for Marston Load 1.5
Typical Value for Prism Load 1.0
K = bedding constant — 0.1 typical value
P_T = Vertical load on pipe w/ perfs — 4.52 lb/in^2 — 650 lb/ft^2
W_c = Marston's load per unit length of pipe = $P_T * D_o$ (lb/in) — 38.96 lb/in
D_o = pipe outer diameter (in) — 8.625 FALSE
t = pipe wall thickness (in) — 0.784 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
D_I = pipe inner diameter = D_o-2t (in) — 7.057 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
D_m = pipe mean diameter = D_o - 1.06t — 7.79 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
r_m = mean radius of the pipe (in) — 3.90 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
E = modulus of elasticity (lb/in^2) — 23,000 lb/in^2 for 50 years at 100°F, Table 5-1/Source No. 1
I = moment of inertia of the pipe wall per unit length — 0.040 in^4
E' = modulus of soil reaction (See Source No. 1) — 3000 lb/in^2 for moderate compaction and fine grained soils

$\Delta X = \dfrac{D_L K W_c r_m^3}{EI + 0.06E'r_m^3} =$ 0.029878 inch

% Ring Deflection = ($\Delta X/D_m$) x 100 = 0.383 % Eq'n 7-38 See Source No. 1

Ring Bending Strain

$\varepsilon = \dfrac{f_D \Delta X 2C}{D_M^2}$

ε = wall strain (%)
f_D = deformation shape factor — 6 non-elliptical shape
D_M = mean diameter (in)
C = outer fiber wall centroid = 0.5 (1.06t) — 0.416 Eq'n 7-41 See Source No. 1
ΔX = ring deflection = $\Delta X/D_m$ — 0.004

$\varepsilon = \dfrac{f_D \Delta X 2C}{D_M} =$ 0.245 % Eq'n 7-37 See Source No. 1

The maximum ring bending strain for high performance polyethylene non-pressure pipe is 4.2%

Pipe passes ring bending strain calculations TRUE

2'Operations
8/8

SCS ENGINEERS			
SHEET 8 of 8			
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Pipe Crushing Calculations Depth above pipe is 2 ft for Operations w/ CAT D7R Series II 8" Diameter Leachate Collection System	BY LEK	DATE 11/7/2003	
	CHECKED JHD	DATE	

Sources:

1 : CPCHEM, The Performance Pipe Engineering Manual
Book 2, Chapter 7 : Buried Pipe Design
2002

2 : Foundation Design Principles and Practices
Second Edition
Donald P. Coduto
Chapter 7, Section 7.3 : Induced Stresses Beneath Shallow Foundations

3: Buried Pipe Design
A.P. Moser
Chapter 3

75 ft Fill Height
Operations

75 Operations
1/8

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations	LEK	11/7/2003
Depth above pipe is 75 ft for Operations w/ CAT D7R Series II	CHECKED	DATE
8" Diameter Leachate Collection System	JHO	

Load on Pipe (Overburden)

Prism Loads, $P_E = wH$ Eq'n 7.1 See Source No. 1

w = unit weight

H = depth

	Depth (ft)	Unit Weight (lb/ft^3)	P_E (lb/ft^2)
Cover Soil	2	123.9	247.7
Intermediate Cover	1.5	123.9	185.8
Waste	69.5	60.0	4170.0
Drainage Sand	2	123.9	247.7

TOTAL SOIL PRISM LOAD: 4851.3 lb/ft^2

Total Depth = 75 ft

Soil Arching, $P_m = C_D wB$

Pm = vertical soil pressure

B = trench width at pipe crown 5 ft

C_D = load coefficient $= \dfrac{1 - e^{-2Ku'H/B}}{2Ku'}$ Eq'n 7.3 See Source No. 1

e = natural log base number

K = Rankine earth pressure coefficient = $\tan^2(45-0.5*\phi)$

ϕ = internal soil friction angle = 27 degrees for waste

u' = friction coefficient between backfill and trench sides = $\tan \phi$

NOTE: The waste unit weight represents the combined unit weight of waste, daily cover, and moisture.

Soil Type	Ku'
Saturated Clay	0.110
Ordinary Clay	0.130
Saturated Top Soil	0.150
Sand and Gravel	0.165
Clean Granular Soil	0.192

	Ku'	C_D	P_m (lb/ft^2)
Cover Soil	0.150	0.32	196
Intermediate Cover	0.165	0.24	149
Waste	0.191	2.58	775
Drainage Sand	0.165	0.32	196

TOTAL SOIL ARCHING LOAD: 1,166.6 lb/ft^2

LARGEST OVERBURDEN LOAD: 4,851.3 lb/ft^2

Load on Pipe (CAT D7R Series II)

Equipment Weight = 54,582 lbs

Number of Tracks = 2 tracks

Track Load = 55,825 lb * 0.5 = 27,913 lbs per track

Ground Contact Area /track = 17.2 ft^2

Length of Track = L = 113 in

Track Width = b = 22 in

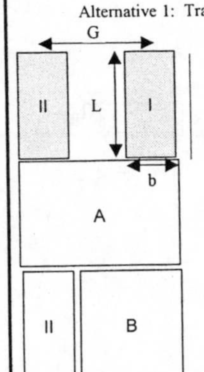
Track Gage = G = 78 in

Live Load = $q*I_c$

q = track load 1620 lb/ft^2

I_c = Influence coefficient

Alternative 1: Track adjacent and parallel to pipe



	b (ft)	L (ft)	z (ft)	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
I	1.83	9.4	75	0.02	0.13	0.001	0.250	0.001
A	8.33	9.4	75	0.11	0.13	0.006	0.252	0.006
B	6.50	9.4	75	0.09	0.13	0.005	0.252	0.005

$\text{Live Load}_1 = I + II = q_I(I_I) + q_A(I_A) - q_B(I_B) =$ 4.62 lb/ft^2

$q_I(I_I) =$ 2.34

$q_A(I_A) =$ 10.52

$q_B(I_B) =$ 8.24

Load on Pipe (Equipment) = 4.62 lb/ft^2

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75 ' Operations
2/18

SCS ENGINEERS

SHEET 2 of 8

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
Pipe Crushing Calculations		LEK	1/27/2004
Depth above pipe is 75 ft for Operations w/ CAT D7R Series II		CHECKED	DATE
8" Diameter Leachate Collection System			

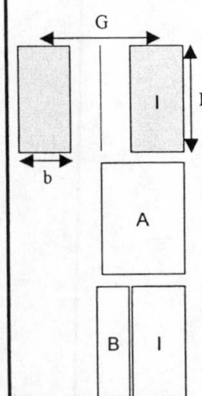
Load on Pipe (Equipment) *Continued*

Live Load = $q*I_c$

q = track load 1620 lb/ft^2

I_c = Influence coefficient

Alternative 2: Track stradling and parallel to pipe



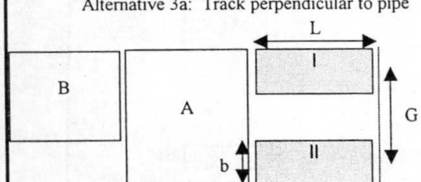
	b	L	z	m = b/z	n = L/z	Eq'n 7.4 See Source No. 2 I*	Eq'n 7.5 See Source No. 2 I**	I
A	4.17	9.4	75	0.06	0.13	0.003	0.251	0.003
B	2.33	9.4	75	0.03	0.13	0.002	0.251	0.002

Live Load$_2$ = 2 * (A - B) = 2 * (q_AI_A - q_BI_B) = 4.66 lb/ft^2

$q_A(I_A)$ =	5.30
$q_B(I_B)$ =	2.97

Load on Pipe (Equipment) = 4.66 lb/ft^2

Alternative 3a: Track perpendicular to pipe



	b	L	z	m = b/z	n = L/z	Eq'n 7.4 See Source No. 2 I*	Eq'n 7.5 See Source No. 2 I**	I
I	1.83	9.4	75	0.02	0.13	0.001	0.250	0.001
A	8.33	9.4	75	0.11	0.13	0.006	0.252	0.006
B	7.42	9.4	75	0.10	0.13	0.006	0.252	0.006

Live Load$_3$ = I + II = $q_I(I_I)$ + $q_A(I_A)$ - $q_B(I_B)$ = 3.48 lb/ft^2

$q_I(I_I)$ =	2.34
$q_A(I_A)$ =	10.52
$q_B(I_B)$ =	9.39

Load on Pipe (Equipment) = 3.48 lb/ft^2

LARGEST EQUIPEMENT LOAD = 4.66 lb/ft^2

VERTICAL OVERBURDEN LOAD = 4851.285 lb/ft^2

VERTICAL EQUIPMENT LOAD = 4.66 lb/ft^2

TOTAL VERTICAL LOAD APPLIED TO PIPE, P_T = 4855.94 lb/ft^2 = 33.72 lb/in^2

SCS ENGINEERS

SHEET 3 of 8

CLIENT	PROJECT		JOB NO.
Hardee County	Landfill Expansion		09199033.09
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 75 ft for Operations w/ CAT D7R Series II 8" Diameter Leachate Collection System		LEK	4/18/2005
		CHECKED	DATE
		JHO	5/20/05

Verify that perforations in the LCRS are adequate for the peak leachate flow.

Discharge Equatic Use discharge equation:

$Q = (Cd)(Ao)(2gh)^{0.5}$

C_d = coeffiecient of discharge = 0.6 for short tube discharge with fluid/wall separation; conservative value.

A_o = Area of orifice

g = gravitational acceleration (32.3 ft^2/s)

h = static head (ft)

Assumptions and Givens:

1. No. acres of landfill expansion = 10 acres
2. Length of pipe per acre = 240 ft/acre
3. Perforation diameter = 0.375 inch
4. No. perforations/ft pipe = 6 perforations/ft of pipe length
5. Maximum head over pipe = 1 ft
6. Maximum leachate flow/acre = 30,088 ft^3/day for 8 acres open (1 acre w/o waste, 7 acres @ 40 feet of waste)

225,058 cfs for 8 acres open (1 acre w/o waste, 7 acres @ 40 feet of waste)
0.3 gpd for 8 acres open (1 acre w/o waste, 7 acres @ 40 feet of waste)
20.9 cfm for 8 acres open (1 acre w/o waste, 7 acres @ 40 feet of waste)

HELP Model Results (Worst Case Filling Sequence)

Peak Q_{open} =	10,012	ft^3/day-acre x 1 acre open =	10,012	ft^3/day
Peak $Q_{10ft\text{-}waste}$ =	6,678	ft^3/day-acre x 0 acre open =	0	ft^3/day
Peak $Q_{40ft\text{-}waste}$ =	2,868	ft^3/day-acre x 7 acre open =	20,076	ft^3/day
			30,088	ft^3/day

Solution:

$A = 0.25\pi \left(0.375'' \frac{ft}{12''}\right)^2$

$A_o = 0.25(\Pi)(d)^2 =$ 0.00077 ft^2

1. Flow per orifice, $Q = (Cd)(Ao)(2gh)^{0.5}$ = 0.0037 ft^3/s
2. Flow per ft of pipe = (Q)(# perfs/ft) = 0.02 ft^3/s per ft of pipe

$= 0.0037 \times 6$ = 1.33 cfm/ft of pipe

3. Peak flow = (max flow per acre)(no. acres) = 0.3 ~~cfs~~ gpd for 8 acres open (1 acre w/o waste, 7 acres @ 40 feet of waste)

= 20.9 cfm for 8 acres open (1 acre w/o waste, 7 acres @ 40 feet of waste)

4. Perforated flow capacity per acre = (flow/ft of pipe) x (length of pipe per acre) $= 1.33 \frac{cfm}{ft\ pipe} \times 240 \frac{ft}{acre}$

= 319.1 cfm/acre

Flow Capacity Design Value

Conclusion:

Design capacity exceeds estimated generation

319.1 cfm/acre	>>>	20.9 cfm for 8 acres open (1 acre w/o waste, 7 acres @ 40 feet of waste)
319.1 cfm/acre	>>>	2.6 cfm for 8 acres open (1 acre w/o waste, 7 acres @ 40 feet of waste)

Perforations are adequate to handle the maximum leachate flow.

$FS = \frac{319.1\ cfm/acre}{2.6\ cfm/acre} = 122$

D.E.P.
MAY 23 2005
Southwest District Tampa

JOHN M. O'NEILL
LICENSE
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STATE OF FLORIDA
PROFESSIONAL ENGINEER
MAY 20 05

15 Operations
3/8

SCS ENGINEERS

SHEET 3 of 8

CLIENT	PROJECT		JOB NO.
Hardee County	Landfill Expansion		09199033.09
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 75 ft for Operations w/ CAT D7R Series II 8" Diameter Leachate Collection System		LEK	11/7/2003
		CHECKED JH	DATE

Verify that perforations in the LCRS are adequate for the peak leachate flow.

Discharge Equatic Use discharge equation:

$Q = (Cd)(Ao)(2gh)^{0.5}$

C_d = coeffiecient of discharge = 0.6 for short tube discharge with fluid/wall separation; conservative value.

A_o = Area of orifice

g = gravitational acceleration (32.3 ft^2/s)

h = static head (ft)

Assumptions and Givens:

1. No. acres of landfill expansion = 11 acres
2. Length of pipe per acre = 240 ft/acre
3. Perforation diameter = 0.375 inch
4. No. perforations/ft pipe = 6 perforations/ft of pipe length
5. Maximum head over pipe = 1 ft
6. Maximum leachate flow/acre = 75,383 gal/day — Per HELP model for initial waste placement, Q = 10,078 cf/day/acre.
   - 0.1166 cfs
   - 0.0106 cfs/acre
   - 0.6362 cfm/acre

Solution:

$A_o = 0.25(\Pi)(d)^2 =$ 0.00077 ft^2

1. Flow per orifice, $Q = (Cd)(Ao)(2gh)^{0.5}$ = 0.0037 ft^3/s
2. Flow per ft of pipe = (Q)(# perfs/ft) = 0.02 ft^3/s per ft of pipe
   = 1.33 cfm/ft of pipe
3. Peak flow = (max flow per acre)(no. acres) = 0.117 cfs
   = 7.00 cfm
4. Perforated flow capacity per acre = (flow/ft of pipe) x (length of pipe per acre)
   = 319.1 cfm/acre

Conclusion:

Design capacity exceeds estimated generation

319.1 cfm/acre >>> 0.6362 cfm/acre

Perforations are adequate to handle the maximum leachate flow.

75' Operations
418

SCS ENGINEERS

SHEET 4 of 8

CLIENT	PROJECT		JOB NO.
Hardee County	Landfill Expansion		09199033.09
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 75 ft for Operations w/ CAT D7R Series II 8" Diameter Leachate Collection System		LEK	11/7/2003
		CHECKED	DATE
		JHB	

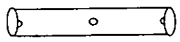
Effective pressure on pipe due to perforations:

$P_{EFF} = \dfrac{P_T \times 12}{(12-L_P)}$ (per EPA SW-870, p. 382)

L_P = Total accumulated length of perforations in one foot of pipe.

Since each perforation is 0.375" diameter and spaced at 6" on center,

L_P = 0.375" x 4 = 1.5 inch



P_T = 33.72 psi

P_{EFF} = 38.5 psi
P_{EFF} = 5,550 psf

Check actual compressive pressure (S_A) per Driscopipe manual:

S_A = 0.5 x (SDR - 1) x P(eff) = 193 psi

The recommended, long-term compressive strength (Y_s) design value for Driscoplex polyethylene pipe is 800 lb/in^2.

S_A (psi):		Y_s (psi):
193	<	800

Pipe passes wall compressive stress perforation calculations TRUE

75' Operations
5/8

SCS ENGINEERS

SHEET 5 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations	LEK	11/7/2003
Depth above pipe is 75 ft for Operations w/ CAT D7R Series II 8" Diameter Leachate Collection System	CHECKED JHD	DATE

Constrained Pipe Wall Buckling (for Driscoplex OD controlled pipe)

$P_{WC} = \dfrac{5.65 * \{RB'E' EI*[12(DR-1)^3]^{-1}\}^{0.5}}{N}$ Eq'n 7-30 See Source No. 1

P_{WC} = allowable constrained buckling pressure (lb/in^2)
R = buoyancy reduction factor = 1 - 0.33 * (H'/H)
H' = groundwater height above pipe (ft) | 1 | ft
H = cover above pipe (ft) | 75 | ft
B' = elastic support factor =$(1+ 4*e^{-0.065H})^{-1}$
E' = soil reaction modulus (lb/in^2) | 3000 | lb/in^2 for moderate compaction/crushed rock, Table 7-7/Source No. 1
E = elastic modulus (lb/in^2) | 23,000 | lb/in^2 for 50 years at 100°F, Table 5-1/Source No. 1
I = moment of inertia = $t^3/12$ | 0.040 | in^4
D_o = pipe outer diameter (in) | 8.625 | inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
t = pipe wall thickness (in) | 0.784 | inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
DR = pipe dimension ratio = D_o/t | 11 | SDR 11 pipe to be used
D_I = pipe inner diameter = D_o-2t (in) | 7.057 | inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
N = safety factor | 2 | recommended by CPChem manual

	H (ft)	H' (ft)	B'	R	P_{WC} (lb/in^2)
3 ft Cover	75	1	0.97	1.00	42.19

P_{WC} = 42.19 lb/in^2
P_{EFF} = 38.54 lb/in^2

Pipe passes contrained wall buckling calculations TRUE

75 Operations
6/8

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations Depth above pipe is 75 ft for Operations w/ CAT D7R Series II 8" Diameter Leachate Collection System	LEK	11/7/2003
	CHECKED JHD	DATE

Constrained Pipe Wall Compressive Stress (for Driscoplex OD controlled pipe)

$S = \frac{P_T D_o}{228t}$ Eq'n 7-23 See Source No. 1

S = pipe wall compressive stress (lb/in^2)

P_T = vertical load applied to pipe w/ perfs (lb/ft^2) 5550 lb/ft^2

D_o = pipe outside diameter (in) 8.625 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)

t = pipe wall thickness (in) 0.784 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)

$S = \frac{P_T D_o}{228t} =$ 212.0 lb/in^2

The recommended, long-term compressive strength (Y_s) design value for Driscoplex polyethylene pipe is 800 lb/in^2.

S (psi):		Y_s (psi):
212	<	800

Pipe passes wall compressive stress calculations TRUE

75' Operations
7/8

SCS ENGINEERS

SHEET 7 of 8

CLIENT	PROJECT		JOB NO.
Hardee County	Landfill Expansion		09199033.09
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 75 ft for Operations w/ CAT D7R Series II 8" Diameter Leachate Collection System		LEK	11/7/2003
		CHECKED	DATE
		JHO	

Iowa Formula

$\Delta X = \dfrac{D_L K W_c r^3}{EI + 0.06er^4}$ Eq'n 3.4 See Source No. 3

ΔX = horizontal deflection (in)
D_L = deflection lag factor
K = bedding constant — 0.1 typical value
W_c = Marston's load per unit length of pipe (lb/in)
r = mean radius of the pipe (in)
E = modulus of elasticity (lb/in^2)
I = moment of inertia of the pipe wall per unit length (in^3)
e = modulus of passive resistance fo the side fill ($lb/in^2(in)$)

Modified Iowa Formula

$\Delta X = \dfrac{D_L K W_c r_m^3}{EI + 0.06E'r_m^3}$ Eq'n 3.5 See Source No. 3

ΔX = horizontal deflection (in)		
D_L = deflection lag factor	1.5	Marston Load
Typical Value for Marston Load 1.5		
Typical Value for Prism Load 1.0		
K = bedding constant	0.1	typical value
P_T = Vertical load on pipe w/ perfs	38.54	lb/in^2 5550 lb/ft^2
W_c = Marston's load per unit length of pipe = $P_T * D_o$ (lb/in)	332.40	lb/in
D_o = pipe outer diameter (in)	8.625	FALSE
t = pipe wall thickness (in)	0.784	inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
D_I = pipe inner diameter = D_o-2t (in)	7.057	inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
D_m = pipe mean diameter = D_o - 1.06t	7.79	inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
r_m = mean radius of the pipe (in)	3.90	inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
E = modulus of elasticity (lb/in^2)	23,000	lb/in^2 for 50 years at 100°F, Table 5-1/Source No. 1
I = moment of inertia of the pipe wall per unit length	0.040	in^4
E' = modulus of soil reaction (See Source No. 1)	3000	lb/in^2 for moderate compaction and fine grained soils

$\Delta X = \dfrac{D_L K W_c r_m^3}{EI + 0.06E'r_m^3} =$ 0.254900 inch

% Ring Deflection = ($\Delta X/D_m$) x 100 = 3.270 % Eq'n 7-38 See Source No. 1

Ring Bending Strain

$\varepsilon = \dfrac{f_D \Delta X 2C}{D_M^2}$

ε = wall strain (%)		
f_D = deformation shape factor	6	non-elliptical shape
D_M = mean diameter (in)		
C = outer fiber wall centroid = 0.5 (1.06t)	0.416	Eq'n 7-41 See Source No. 1
ΔX = ring deflection = $\Delta X/D_m$	0.033	

$\varepsilon = \dfrac{f_D \Delta X 2C}{D_M} =$ 2.092 % Eq'n 7-37 See Source No. 1

The maximum ring bending strain for high performance polyethylene non-pressure pipe is 4.2%

Pipe passes ring bending strain calculations TRUE

SCS ENGINEERS

SHEET 8 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations Depth above pipe is 75 ft for Operations w/ CAT D7R Series II 8" Diameter Leachate Collection System	LEK	11/7/2003
	CHECKED JHO	DATE

Sources:

1 : CPCHEM, The Performance Pipe Engineering Manual
Book 2, Chapter 7 : Buried Pipe Design
2002

2 : Foundation Design Principles and Practices
Second Edition
Donald P. Coduto
Chapter 7, Section 7.3 : Induced Stresses Beneath Shallow Foundations

3: Buried Pipe Design
A.P. Moser
Chapter 3

25 ft Fill Height

Operations

24" ϕ SideSlope Riser

24" Riser
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SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations Depth above pipe is 25 ft for Operations w/ CAT D7R Series II 24" Diameter Leachate Collection Sideslope Riser	LEK	2/18/2004
	CHECKED JHO	DATE

Load on Pipe (Overburden)

Prism Loads, $P_E = wH$ Eq'n 7.1 See Source No. 1

w = unit weight

H = depth

	Depth (ft)	Unit Weight (lb/ft^3)	P_E (lb/ft^2)
Cover Soil	2	123.9	247.7
Intermediate Cover	1.5	123.9	185.8
Waste	19.5	60.0	1170.0
Drainage Sand	2	123.9	247.7

TOTAL SOIL PRISM LOAD: 1851.3 lb/ft^2

Total Depth = 25 ft

Soil Arching, $P_m = C_D wB$

Pm = vertical soil pressure

B = trench width at pipe crown 3 ft

C_D = load coefficient $= \dfrac{1 - e^{-2Ku'H/B}}{2Ku'}$ Eq'n 7.3 See Source No. 1

e = natural log base number

K = Rankine earth pressure coefficient = $\tan^2(45-0.5*\phi)$

ϕ = internal soil friction angle = 27 degrees for waste

u' = friction coefficient between backfill and trench sides = $\tan \phi$

NOTE: The waste unit weight represents the combined unit weight of waste, daily cover, and moisture.

Soil Type	Ku'
Saturated Clay	0.110
Ordinary Clay	0.130
Saturated Top Soil	0.150
Sand and Gravel	0.165
Clean Granular Soil	0.192

	Ku'	C_D	P_m (lb/ft^2)
Cover Soil	0.150	0.32	118
Intermediate Cover	0.165	0.24	89
Waste	0.191	1.86	335
Drainage Sand	0.165	0.32	117

TOTAL SOIL ARCHING LOAD: 569.9 lb/ft^2

LARGEST OVERBURDEN LOAD: 1,851.3 lb/ft^2

Load on Pipe (CAT D7R Series II)

Equipment Weight = 54,582 lbs

Number of Tracks = 2 tracks

Track Load = 55,825 lb * 0.5 = 27,913 lbs per track

Ground Contact Area /track= 17.2 ft^2

Length of Track = L = 113 in

Track Width = b = 22 in

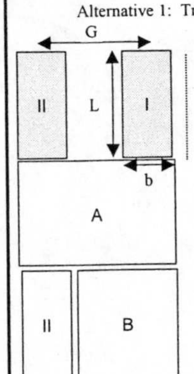
Track Gage = G = 78 in

Live Load = $q*I_c$

q = track load 1620 lb/ft^2

I_c = Influence coefficient

Alternative 1: Track adjacent and parallel to pipe



	b (ft)	L (ft)	z (ft)	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
I	1.83	9.4	25	0.07	0.38	0.012	0.254	0.012
A	8.33	9.4	25	0.33	0.38	0.049	0.264	0.049
B	6.50	9.4	25	0.26	0.38	0.040	0.262	0.040

Live $Load_1$ = I + II = $q_I(I_I) + q_A(I_A) - q_B(I_B)$ = 34.67 lb/ft^2

$q_I(I_I)$ = 19.05

$q_A(I_A)$ = 80.02

$q_B(I_B)$ = 64.41

Load on Pipe (Equipment) = 34.67 lb/ft^2

f:\project\Hardee\09199033.09\calcs\pipecalcs\24inchriser.xls

24" Riser
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SCS ENGINEERS

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
Pipe Crushing Calculations		LEK	1/27/2004
Depth above pipe is 25 ft for Operations w/ CAT D7R Series II		CHECKED	DATE
24" Diameter Leachate Collection Sideslope Riser		DLB	

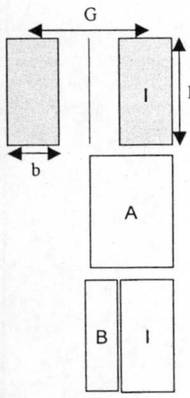
Load on Pipe (Equipment) *Continued*

Live Load = $q*I_c$

q = track load 1620 lb/ft^2

I_c = Influence coefficient

Alternative 2: Track stradling and parallel to pipe



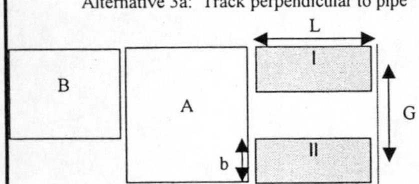
	b	L	z	m = b/z	n = L/z	Eq'n 7.4 See Source No. 2 I*	Eq'n 7.5 See Source No. 2 I**	I
A	4.17	9.4	25	0.17	0.38	0.026	0.258	0.026
B	2.33	9.4	25	0.09	0.38	0.015	0.255	0.015

Live Load$_2$ $= 2 * (A - B) = 2 * (q_AI_A - q_BI_B) =$ 36.73 lb/ft^2

$q_A(I_A)$ =	42.55
$q_B(I_B)$ =	24.19

Load on Pipe (Equipment) = 36.73 lb/ft^2

Alternative 3a: Track perpendicular to pipe



	b	L	z	m = b/z	n = L/z	Eq'n 7.4 See Source No. 2 I*	Eq'n 7.5 See Source No. 2 I**	I
I	1.83	9.4	25	0.07	0.38	0.012	0.254	0.012
A	8.33	9.4	25	0.33	0.38	0.049	0.264	0.049
B	7.42	9.4	25	0.30	0.38	0.045	0.263	0.045

Live Load$_3$ $= I + II = q_I(I_I) + q_A(I_A) - q_B(I_B) =$ 26.67 lb/ft^4

$q_I(I_I)$ =	19.05
$q_A(I_A)$ =	80.02
$q_B(I_B)$ =	72.40

Load on Pipe (Equipment) = 26.67 lb/ft^2

LARGEST EQUIPEMENT LOAD = 36.73 lb/ft^2

VERTICAL OVERBURDEN LOAD = 1851.285 lb/ft^2

VERTICAL EQUIPMENT LOAD = 36.73 lb/ft^2

TOTAL VERTICAL LOAD APPLIED TO PIPE, P_T = 1888.01 lb/ft^2 = 13.11 lb/in^2

24" Riser
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SCS ENGINEERS

SHEET 3 of 6

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
Pipe Crushing Calculations		LEK	2/18/2004
Depth above pipe is 25 ft for Operations w/ CAT D7R Series II		CHECKED	DATE
24" Diameter Leachate Collection Sideslope Riser		JHO	

Constrained Pipe Wall Buckling (for Driscoplex OD controlled pipe)

$P_{WC} = \dfrac{5.65 * \{RB'E' EI*[12(DR-1)^3]^{-1}\}^{0.5}}{N}$ Eq'n 7-30 See Source No. 1

P_{WC} = allowable constrained buckling pressure (lb/in^2)
R = buoyancy reduction factor = 1 - 0.33 * (H'/H)
H' = groundwater height above pipe (ft) 1 ft
H = cover above pipe (ft) 25 ft
B' = elastic support factor =$(1+ 4*e^{-0.065H})^{-1}$
E' = soil reaction modulus (lb/in^2) 2000 lb/in^2 for moderate compaction/coarse sand, Table 7-7/Source No. 1
E = elastic modulus (lb/in^2) 23,000 lb/in^2 for 50 years at 100°F, Table 5-1/Source No. 1
I = moment of inertia = $t^3/12$ 0.235 in^4
D_o = pipe outer diameter (in) 24.000 inches for a 24 inch diameter SDR 17 pipe (Driscopipe)
t = pipe wall thickness (in) 1.412 inches for a 24 inch diameter SDR 17 pipe (Driscopipe)
DR = pipe dimension ratio = D_o/t 17 SDR 17 pipe to be used
D_I = pipe inner diameter = D_o-2t (in) 21.176 inches for a 24 inch diameter SDR 17 pipe (Driscopipe)
N = safety factor 2 recommended by CPChem manual

	H (ft)	H' (ft)	B'	R	P_{WC} (lb/in^2)
3 ft Cover	25	1	0.56	0.99	31.11

P_{WC} = 31.11 lb/in^2
P_{EFF} = 13.11 lb/in^2

Pipe passes contrained wall buckling calculations TRUE

24" Riser
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SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations Depth above pipe is 25 ft for Operations w/ CAT D7R Series II 24" Diameter Leachate Collection Sideslope Riser	LEK	2/18/2004
	CHECKED OHO	DATE

Constrained Pipe Wall Compressive Stress (for Driscoplex OD controlled pipe)

$S = \frac{P_T D_o}{228t}$ Eq'n 7-23 See Source No. 1

S = pipe wall compressive stress (lb/in^2)

P_T = vertical load applied to pipe w/ perfs (lb/ft^2) 1888 lb/ft^2

D_o = pipe outside diameter (in) 24 inches for a 24 inch diameter SDR 17 pipe (Driscopipe)

t = pipe wall thickness (in) 1.412 inches for a 24 inch diameter SDR 17 pipe (Driscopipe)

$S = \frac{P_T D_o}{228t} =$ 111.4 lb/in^2

The recommended, long-term compressive strength (Y_s) design value for Driscoplex polyethylene pipe is 800 lb/in^2.

S (psi):		Y_s (psi):
111	<	800

Pipe passes wall compressive stress calculations TRUE

24" Riser
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CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations Depth above pipe is 25 ft for Operations w/ CAT D7R Series II 24" Diameter Leachate Collection Sideslope Riser	LEK	2/18/2004
	CHECKED	DATE
	SJ	

Iowa Formula

$\Delta X = \frac{D_L K W_c r^3}{EI + 0.06er^4}$ Eq'n 3.4 See Source No. 3

ΔX = horizontal deflection (in)
D_L = deflection lag factor
K = bedding constant 0.1 typical value
W_c = Marston's load per unit length of pipe (lb/in)
r = mean radius of the pipe (in)
E = modulus of elasticity (lb/in^2)
I = moment of inertia of the pipe wall per unit length (in^3)
e = modulus of passive resistance fo the side fill (lb/in^2(in))

Modified Iowa Formula

$\Delta X = \frac{D_L K W_c r_m^3}{EI + 0.06E' r_m^3}$ Eq'n 3.5 See Source No. 3

ΔX = horizontal deflection (in)		
D_L = deflection lag factor	1.5	Marston Load
Typical Value for Marston Load 1.5		
Typical Value for Prism Load 1.0		
K = bedding constant	0.1	typical value
P_T = Vertical load on pipe w/ perfs	13.11	lb/in^2 1888 lb/ft^2
W_c = Marston's load per unit length of pipe = $P_T * D_o$ (lb/in)	314.67	lb/in
D_o = pipe outer diameter (in)	24.000	inches for a 24 inch diameter SDR 17 pipe (Driscopipe)
t = pipe wall thickness (in)	1.412	inches for a 24 inch diameter SDR 17 pipe (Driscopipe)
D_I = pipe inner diameter = D_o-2t (in)	21.176	inches for a 24 inch diameter SDR 17 pipe (Driscopipe)
D_m = pipe mean diameter = D_o - 1.06t	22.50	inches for a 24 inch diameter SDR 17 pipe (Driscopipe)
r_m = mean radius of the pipe (in)	11.25	inches for a 24 inch diameter SDR 17 pipe (Driscopipe)
E = modulus of elasticity (lb/in^2)	23,000	lb/in^2 for 50 years at 100°F, Table 5-1/Source No. 1
I = moment of inertia of the pipe wall per unit length	0.235	in^4
E' = modulus of soil reaction (See Source No. 1)	2000	lb/in^2 for moderate compaction and fine grained soils

$\Delta X = \frac{D_L K W_c r_m^3}{EI + 0.06E' r_m^3} =$ 0.381300 inch

% Ring Deflection = $(\Delta X/D_m) \times 100$ = 1.694 % Eq'n 7-38 See Source No. 1

Ring Bending Strain

$\varepsilon = \frac{f_D \Delta X 2C}{D_M^2}$

ε = wall strain (%)		
f_D = deformation shape factor	6	non-elliptical shape
D_M = mean diameter (in)		
C = outer fiber wall centroid = 0.5 (1.06t)	0.748	Eq'n 7-41 See Source No. 1
ΔX = ring deflection = $\Delta X/D_m$	0.017	

$\varepsilon = \frac{f_D \Delta X 2C}{D_M} =$ 0.676 % Eq'n 7-37 See Source No. 1

The maximum ring bending strain for high performance polyethylene non-pressure pipe is 4.2%

Pipe passes ring bending strain calculations TRUE

24" Riser
6/6

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CLIENT Hardee County	PROJECT Landfill Expansion		JOB NO. 09199033.09
SUBJECT Pipe Crushing Calculations Depth above pipe is 25 ft for Operations w/ CAT D7R Series II 24" Diameter Leachate Collection Sideslope Riser		BY LEK	DATE 2/18/2004
		CHECKED JHD	DATE

Sources:

1 : CPCHEM, The Performance Pipe Engineering Manual
Book 2, Chapter 7 : Buried Pipe Design
2002

2 : Foundation Design Principles and Practices
Second Edition
Donald P. Coduto
Chapter 7, Section 7.3 : Induced Stresses Beneath Shallow Foundations

3: Buried Pipe Design
A.P. Moser
Chapter 3

Attachments

Attachment I
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D.E.P.
MAY 23 2005
Southwest District Tampa

7. Buried Pipe Design

The design of a subsurface pipe installation is based on principles of soil-structure interaction, that is the pipe and the surrounding soil act together to control the pipes performance. The role each plays in controlling performance depends on their stiffness relative to each other.

Pipes that are more stiff than the surrounding soil are typically called rigid. With rigid pipes, soil and surcharge loads are transmitted around the pipes ing from crown (top) to invert (bottom) by virtue of the pipes internal bending and compressive strength. Rigid pipes undergo little deflection. In some circumstances, polyethylene pipes may behave as a rigid pipe, such as the installation of low DR pipe in marsh soils. Here the pipe has greater stiffness than the surrounding soil, so the pipe properties become the major determinant of burial strength.

Pipes that are less stiff than the surrounding soil are called flexible. With weak soil support, relatively small earth loads may cause flexible pipe deflection. However, when properly buried, the surrounding soil greatly increases the pipes load-carrying capability as well as reduces the earth loads reaching the pipe.

The earth load and surcharge pressures applied to the soil backfill cause vertical and horizontal pipe deflection. The horizontal deflection, usually extension, results in the pipe wall pushing into the embedment soil. This action mobilizes passive resistance forces, which in turn limits horizontal deflection and balances the vertical load. More passive resistance is mobilized with stiffer surrounding soil, so less deflection occurs. Most polyethylene pipe should be considered flexible because the pipes contribution to resisting deflection is usually less than that of the surrounding soil.

Therefore, with polyethylene pipe it is important to check each application to ensure that the installed design (which would include both pipe and embedment soils) is adequate. The design procedures in this section may be applied to both rigid and flexible pipes

General Design Procedure

Once the pipe diameter has been determined, a pipe is selected by its wall construction. Lower DR PLEXCO pipes, and higher RSC SPIROLITE pipes have greater external load capacity. However, greater load capacity is also more costly, so the optimum design is a balance of the pipe strength and embedment quality that is capable of handling the imposed loads. The completed buried pipe design should specify the pipe size (OD or ID), wall construction (DR or RSC Class), required embedment materials, and placement (installation) requirements for that embedment.

The initial design step is to determin dead loads and surcharge loads. Follov ing this, the pipe selection is checked fo its ability to carry the imposed loads rela-

Attachment 1
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tive to the quality of the embedment surrounding the pipe.

Usually, this is an iterative process. Several pipe selections may need to be tried before settling on the optimum design. A pipe selection may need to be changed if loads or embedment are changed, or if the selected pipe is insufficient or excessive for the anticipated loads.

Typically, only the loads in the direction of the pipe ring (circumferential direction) are checked. The designer usually assumes that there are no significant loads acting in the longitudinal (axial) direction of the pipe. This is a reasonable assumption for pipe supported uniformly along its length.

In this manual, the methods for calculating loads, and the pipe's response are based on analytical and empirical equations that are appropriate for polyethylene pipe. Generally, these equations are sufficient for most designs, but they are not exact due to the non-homogeneous nature of soil, the difficulty in characterizing soil as an engineering material, the complexity of soil-pipe interaction, and the variability of construction. Other satisfactory methods for design may be available.

The design guidelines in this manual are contingent upon the pipe being installed according to recognized principles for flexible pipe installation such as those reflected in ASTM D-2321; ASTM D-2774; PLEXCO Bulletin No. 914, *SPIROLITE Installation Guide;* PLEXCO Application Note No. 7, *Pipe Embedment and Final Backfill*; and Plastics Pipe Institute publications, including TR-31, *Underground Installation of Polyolefin Piping.*

Information on this page rev. 10/97—supersedes all previous issues.

Because of the complexities of the soil-pipe interaction, this manual should not be substituted for the judgment of a professional engineer for achieving specific project requirements. In some cases more exact solutions may be required than can be obtained from the equations and methods in this manual.

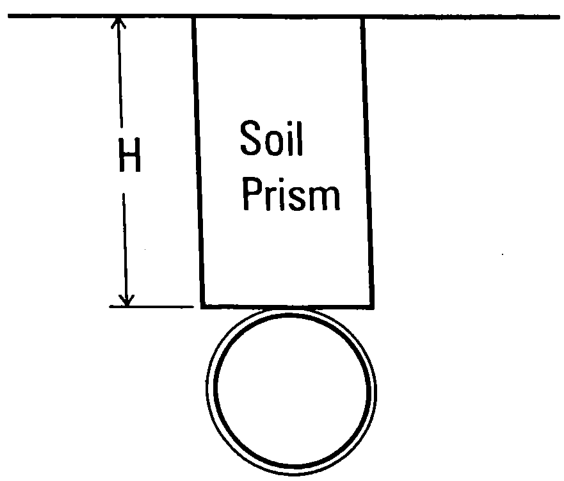
Loads on Buried Pipe

The load applied to a buried pipe consists of dead load and surcharge load. The dead load is the permanent load from the weight of soil and pavement above the pipe. Surcharge loads are loads applied at the surface and may or may not be permanent. Surcharge loads include the loads from vehicles and structures. Vehicular loads are called live loads.

Dead Loads

In designing polyethylene pipes, it is commonplace to assume that the overburden load applied to the pipe crown is equal to the weight of the soil column (or prismatic element) projecting above the pipe. Often, this is referred to as the prism load. See Figure 7-1, below.

Figure 7-1 **Soil Prism**



The prism load is a handy convention for calculating the earth pressure on the pipe when estimating vertical deflection, but the actual load transmitted to a pipe from the soil mass depends on the relative stiffnesses of the soil and the pipe. The load applied to a flexible plastic pipe may be considerably less than the prism load because soil shear resistance transfers part of the soil load directly above the pipe, into the trench sidewalls and the embedment. This transfer is called arching. To account for arching, pipe designers often calculate loads using the Marston method.

Design methods for both prism and arching loads follow, and the designer may use both methods for a buried pipe design.

Prism Load

The simplest case for determining the vertical earth load on a horizontal surface in a mass of soil occurs when the soil has uniform stiffness and weight throughout, with no large voids or buried structures present. Then, the vertical earth pressure acting on a horizontal surface at a depth is equal to the prism load per unit area:

$$P_E = wH \tag{7-1}$$

Where

P_E = vertical soil pressure, lb/ft^2

w = unit weight of soil, lb/ft^3

H = soil height above pipe crown, ft

Soil Arching

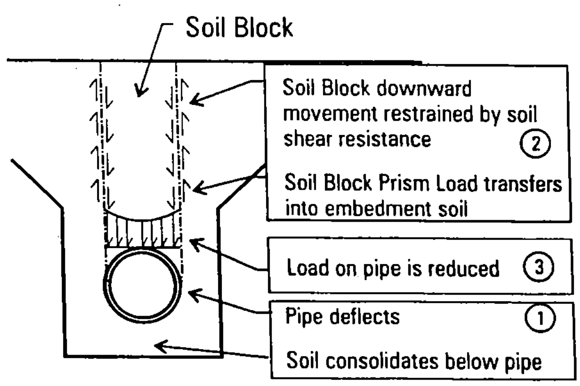
Theoretically, the prism load occurs on a buried pipe only when the pipe has stiffness equivalent to that of the surrounding soil. More commonly, the pipe and soil are not the same stiffness, so the pipe either sees more or less than the prism load, depending on the relative pipe and soil stiffnesses.

When the pipe is less stiff than the soil, as is the case with most flexible pipe, the soil above the pipe distributes load away from the pipe and into the soil beside the pipe.

Arching can be defined as the difference between the applied load and the prism load. The term arching is usually taken to imply a reduction in vertical load. When the pipe takes on more vertical load than the prism load, reverse arching is said to occur.

Arching in the backfill above a buried pipe is mobilized by downward movement of the backfill. This may be initiated by pipe deflection, compression of the deeper layers of the backfill, or settlement beneath the pipe.

Figure 7-2 **Soil Arching Development**



For a flexible pipe, arching is usually initiated by vertical deflection of the pipe crown. The soil tries to follow the pipe downward, but the soils movement is restrained by shear resistance (frictional forces and cohesion) along shear planes in the backfill. This action causes part of the weight of the backfill soil to be transferred into the adjacent soil. Therefore, the amount of force exerted on the pipe

Information on this page rev. 8/92—supersedes all previous issues.

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by the backfill is less than the weight of the backfill soil mass, that is, less than the prism load.

In most cases, arching is permanent, and it occurs in most stable applications. However, arching is maintained by soil shear stresses, and may not occur when pipe is located beneath large vibrating machines, in shallow cover locations subjected to vehicular traffic, or in soft, unstable soil backfills.

Marston Load

When calculating the earth load on a flexible pipe, the Marston load generally gives a more realistic value than the prism load. Based on experiments and field measurements, Marston published a buried pipe design method in 1930 that accounts for arching. His method is widely accepted and can be found in ASCE Manual No. 60.

Marston considered pipe buried in a trench and pipe buried in an embankment as different cases. The backfill soil in a trench was considered to be supported through shear stresses by the undisturbed trench wall soil. This is the most common case for polyethylene pipe arching. Marston's formula gives the equation for finding the loads on a flexible pipe buried in a trench. This equation can be modified to obtain the vertical soil pressure applied to a pipe installed in a trench as given in the following equation.

$$P_M = C_D\, w\, B_D \qquad (7\text{-}2)$$

Where terms are previously defined, and

P_M = vertical pressure on pipe, lb/ft^2

B_D = trench width at pipe crown, ft

C_D = load coefficient

$$C_D = \frac{1 - e^{-2\,Ku' \frac{H}{B_D}}}{2\,Ku'} \qquad (7\text{-}3)$$

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e = natural log base number, 2.71828

K = Rankine Earth Pressure

tan^2 (45 - Φ/2)

Φ = Internal friction angle, deg

H = soil cover height, ft

u′ = friction coefficient between backfill and trench sides

Ku′ values may be characterized as follows:

Table 7-1 **Ku′ Typical Values**

Soil	*Typical Ku′*
Saturated Clay	0.110
Ordinary Clay	0.130
Saturated Top Soil	0.150
Sand and Gravel	0.165
Clean Granular Soil	0.192

The load applied to a pipe in an embankment is typically higher than that for a pipe in a trench. The actual load depends on the relative stiffness between the embankment soil and the pipe. For an embankment condition, the prism load is typically used for calculating vertical pressure on flexible pipe.

Soil Creep

When analytical methods are not available for precise calculations, pipe designers frequently ignore soil creep, especially when the backfill is cohesionless. This is a conservative design approach for plastic pipe, which tends to creep at a faster rate than cohesionless soils. When subjected to 50% or more of their peak shear load strength, clayey soils exhibit considerable creep, and show significantly more creep than cohesionless soils, especially when saturated.

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When a clay backfill is placed over a pipe, shear resistance mobilization occurs and, initially, arching may be high. However, where backfill stress concentrations exist such as along the shearing surfaces, the stress level in the clay may approach significant levels. Along these stress concentrations, creep occurs, allowing backfill soil movement toward the pipe and a corresponding load increase on the pipe. With the passage of time more creep occurs.

Because most clayey soils have some frictional resistance, the prism load is usually never reached. However, a conservative design approach should be taken. A low friction angle is usually assumed for clays when using Marston's equation. Typical values are 11° for ordinary clay, and 8° for a saturated clay. The Table 7-1 Ku′ values reflect these friction angles.

Example 7-1

(a) Find the Marston Load vertical soil pressure acting on a 36" OD pipe under 18 ft of 120 lb/ft^3 ordinary clay cover in a 6 ft wide trench. (b) Compare the vertical soil pressures by the Marston and prism methods.

Solution: (a) First, the load coefficient, C_D, is found using Equation (7-3) and Table 7-1, then the Marston Load soil pressure is determined using Equation (7-2).

Calculate the ratio of H/B_D.

$$\frac{H}{B_D} = \frac{18}{6} = 3$$

From Table 7-1, the Ku′ value for ordinary clay is 0.130. Solving Equation (7-3) gives

$$C_D = \frac{1 - e^{-2(0.130)(3.0)}}{2(0.130)} = 2.1$$

Equation (7-2) can now be solved for P_M.

$$P_M = 2.1(120)\,6 = 1512\; lb/ft^3$$

(b) The prism load soil pressure is determined using Equation (7-1).

$$P_E = (120)(18) = 2160\; lb/ft^3$$

Modified Arching Load

For flexible pipe, a more conservative approach is to use a soil pressure load between the prism load and the Marston load. One approach is to add 40 percent of the difference between the prism load and the Marston load to the Marston load. Equation (7-4) may be used to obtain the modified arching load vertical soil pressure.

$$P_C = 0.6\,P_M + 0.4\,P_E \qquad \textbf{(7-4)}$$

where terms are as defined above, and

P_C = modified arching vertical soil pressure, lb/ft^2

For Example 7-1, the modified arching vertical soil pressure is:

$$P_C = 0.6(1512) + 0.4(2160) = 1771\; lb/ft^2$$

A value for the modified arching vertical soil pressure suitable for most soils may be found using Equation (7-5).

$$P_c = F\,w\,H \qquad \textbf{(7-5)}$$

where terms are previously defined, and

F = arching coefficient

$$F = \frac{P_M + 0.4(P_E - P_M)}{P_E} \qquad \textbf{(7-6)}$$

Figure 7-3, next page, presents a graphical solution for the arching coefficient, F, based on the Marston load obtained with Ku′ = 0.130 for ordinary clay soil. Thus the Figure 7-3 arching coefficient is conservative for soils having a Ku′ value greater than 0.130. The arching co-

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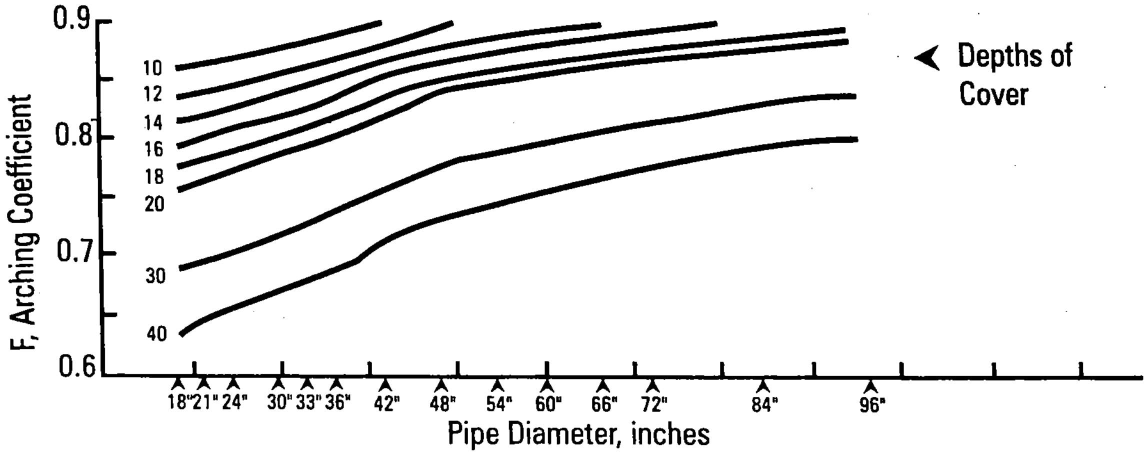
Figure 7-3 **Arching Coefficient for Modified Arching Load**
Based on clay soil, Ku′ = 0.130, and trench widths for SPIROLITE pipe of ID plus 3 ft for 18" - 42" ID and ID plus 4 ft for 48" - 96" ID.



efficient should be used only where the trench width does not exceed 3 ft plus pipe OD for 42" and smaller pipe, and 4 ft plus pipe OD for 48" and larger pipe.

For Example 7-1, the arching coefficient from Figure 7-3 is 0.82, and Equation (7-5) yields

$$P_c = 0.82\,(120)\,(18) = 1771\, lb / ft^2$$

Surcharge Load

The following design methods may be used to determine vertical pressures on the pipe from surface loads. The equations are accurate only to the extent of their appropriateness for a given application. Therefore, it is recommended that the final design be reviewed by a professional engineer.

Surcharge loads may be distributed loads, such as a footing, foundation, or an ash pile, or may be point loads, such as vehicle wheels. The load will be distributed through the soil such that there is a reduction in pressure with an increase in depth or horizontal distance from the surcharged area. The pressure at a point beneath the surcharge load depends on load magnitude, and on the surface area over which the surcharge is applied. Usual design practice is to equate the load on a buried pipe from a surcharge load with the downward pressure acting at the plane of the pipe crown. Once the surcharge load is determined, the total load acting on the pipe is the sum of the earth load and the surcharge load.

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Distributed Load Over Pipe

This design method may be used to find the rectangular area, distributed surcharge load on buried pipes beneath structures such as footings and floors, or other stationary loads such as coal or ash piles.

The method assumes the Boussinesq equation for pressure, and finds the soil pressure acting at a point below the surcharge, and located at the same depth as the crown of the pipe. This pressure is considered to be equal to the vertical pressure acting on the pipe.

Refer to Figure 7-4A, page 44. The point pressure is found by dividing the rectangular surcharge area (ABCD) into four sub-area rectangles (a, b, c, and d) which

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have a common corner, E, in the surcharge area, and over the pipe. The surcharge load is the sum of the four sub-area loads at the subsurface point. Each sub-area load, is calculated by multiplying an influence coefficient, I_C, from Table 7-2, by the surcharge pressure.

$$P_L = P_a + P_b + P_c + P_d \qquad \textbf{(7-7)}$$

where

P_L = surcharge load pressure at point, lb/ft²

P_a = sub-area surcharge load, lb/ft², area a

P_b = sub-area surcharge load, lb/ft², area b

P_c = sub-area surcharge load, lb/ft², area c

P_d = sub-area surcharge load, lb/ft², area d

$$P_a = I_C\, w_S \qquad \textbf{(7-8)}$$

I_C = influence coefficient from Table 7-2

w_S = distributed surcharge pressure acting over ground surface, lb/ft²

Table 7-2 **Influence Coefficient, I_C, for Distributed Loads Over Pipe**

M/H	N/H						
	0.1	0.2	0.3	0.4	0.5	0.6	0.7
0.1	0.005	0.009	0.013	0.017	0.020	0.022	0.024
0.2	0.009	0.018	0.026	0.033	0.039	0.043	0.047
0.3	0.013	0.026	0.037	0.047	0.056	0.063	0.069
0.4	0.017	0.033	0.047	0.060	0.071	0.080	0.087
0.5	0.020	0.039	0.056	0.071	0.084	0.095	0.103
0.6	0.022	0.043	0.063	0.080	0.095	0.107	0.117
0.7	0.024	0.047	0.069	0.087	0.103	0.117	0.128
0.8	0.026	0.050	0.073	0.093	0.110	0.125	0.137
0.9	0.027	0.053	0.077	0.098	0.116	0.131	0.144
1.0	0.028	0.055	0.079	0.101	0.120	0.136	0.149
1.2	0.029	0.057	0.083	0.106	0.126	0.143	0.157
1.5	0.030	0.060	0.086	0.110	0.131	0.149	0.164
2.0	0.031	0.061	0.089	0.113	0.135	0.153	0.169
∞	0.032	0.062	0.090	0.115	0.137	0.156	0.172
M/H	N/H						
	0.8	0.9	1.0	1.2	1.5	2.0	∞
0.1	0.026	0.027	0.028	0.029	0.030	0.031	0.032
0.2	0.050	0.053	0.055	0.057	0.060	0.061	0.062
0.3	0.073	0.077	0.079	0.083	0.086	0.089	0.090
0.4	0.093	0.098	0.101	0.106	0.110	0.113	0.115
0.5	0.110	0.116	0.120	0.126	0.131	0.135	0.137
0.6	0.125	0.131	0.136	0.143	0.149	0.153	0.156
0.7	0.137	0.144	0.149	0.157	0.164	0.169	0.172
0.8	0.146	0.154	0.160	0.168	0.176	0.181	0.185
0.9	0.154	0.162	0.168	0.178	0.186	0.192	0.196
1.0	0.160	0.168	0.175	0.185	0.194	0.200	0.205
1.2	0.168	0.178	0.185	0.196	0.205	0.209	0.212
1.5	0.176	0.186	0.194	0.205	0.211	0.216	0.223
2.0	0.181	0.192	0.200	0.209	0.216	0.232	0.240
∞	0.185	0.196	0.205	0.212	0.223	0.240	0.250

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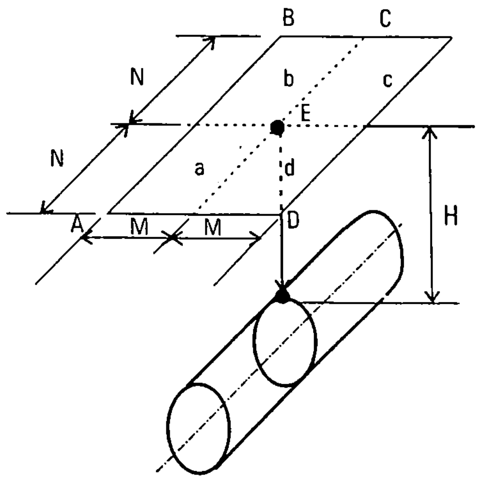
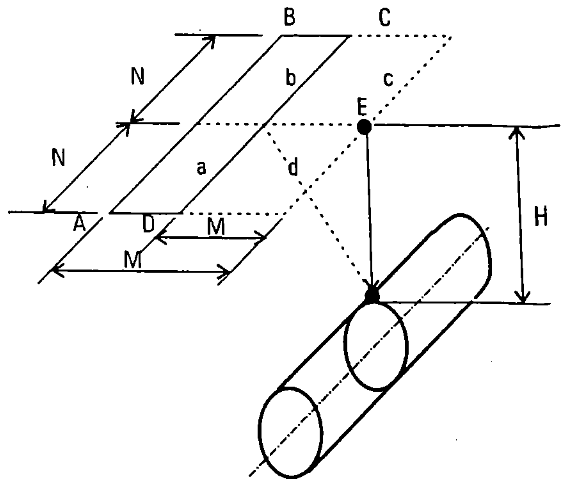
Figure 7-4 Distributed Load Over Pipe



A. Distributed Load Over Pipe



B. Distributed Load Not Over Pipe

If the four sub-areas are equivalent, then Equation (7-7) may be simplified to

$$P_L = 4\, I_C\, w_S \qquad \textit{(7-9)}$$

The influence factor is dependent upon the dimensions of the rectangular area, and upon the depth to the pipe crown. Table 7-2 Influence Coefficient terms, depicted in Figure 7-4, are defined as

H = vertical distance from surface to pipe crown, ft

M = horizontal distance, normal to the pipe centerline, from the center of the load to the load edge, ft

N = horizontal distance, parallel to the pipe centerline, from the center of the load to the load edge, ft

Interpolation may be used to find values not shown. The influence factor gives the portion (or influence) of the load that reaches a given depth beneath the corner of the loaded area.

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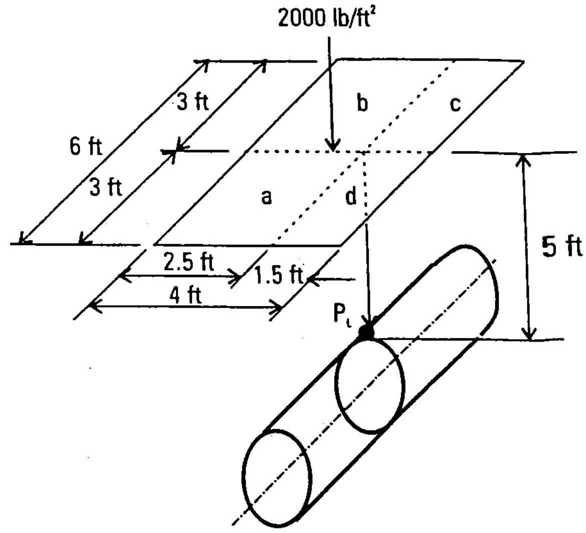
Example 7-2

Find the vertical surcharge load for the 4′ x 6′, 2000 lb/ft^2 footing shown below.

Solution: Use Equations (7-7) and (7-8), Table 7-2, and Figure 7-4. The 4′ x 6′ footing is divided into four sub-areas, such that the common corner is over the pipe.

Figure 7-5 Illustration for Use with Example 7-2



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	Sub-area			
	a	b	c	d
M	2.5	2.5	1.5	1.5
N	3	3	3	3
M/H	0.5	0.5	0.3	0.3
N/H	0.6	0.6	0.6	0.6
I	0.095	0.095	0.063	0.063
Px	190	190	126	126
P_L = 632 lb/ft²				

Determine sub-area dimensions for M, N, and H, then calculate M/H and N/H. Find the Influence Coefficient from Table 7-2 (page 43), solve Equation (7-8) for each sub area, P_a, P_b, P_c, P_d, and Equation (7-7) for P_L.

Distributed Load Not Over Pipe

This design method may be used to find the surcharge load on buried pipes near, but not directly below uniformly distributed loads such as concrete slabs, footings and floors, or other stationary rectangular area loads.

The method is similar to the method for determining the surcharge load when the surcharge is directly above the pipe, except that the area directly above the pipe that is not covered by the surcharge load must be deducted from the overall load on the pipe.

Refer to Figure 7-4B, previous page. Since there is no surcharge directly above the pipe centerline, an imaginary surcharge load of the same pressure per unit area as the actual load, is applied to sub-areas c and d. The surcharge loads for sub-areas a+d and b+c, are determined, then the surcharge loads from the imaginary areas c and d are deducted to find the surcharge pressure on the pipe.

$$P_L = P_{a+d} + P_{b+c} - P_d - P_c \qquad \textbf{(7-10)}$$

where terms are as previously defined, and

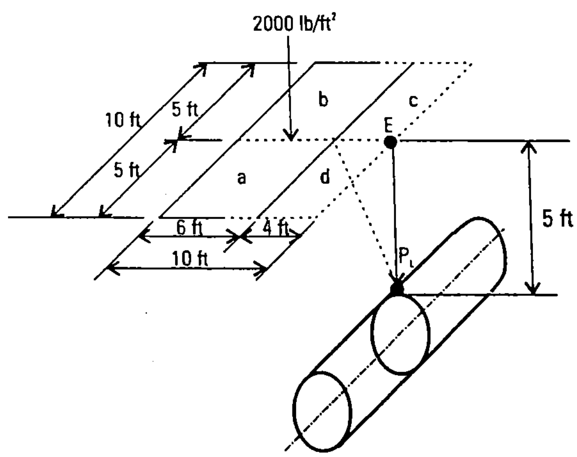
P_{a+d} = surcharge load of combined sub-areas a and d, lb/ft²

P_{b+c} = surcharge load of combined sub-areas b and c, lb/ft²

Example 7-3

Find the vertical surcharge pressure for the 6 x 10, 2000 lb/ft² slab shown below.

Figure 7-6 **Illustration for Use with Example 7-3**



Solution: Use Equations (7-7) and (7-10), Table 7-2 (page 43), and Figure 7-4B (previous page). The surcharge area includes the non-loaded area between the pipe and the slab. Divide the surcharge area into four sub-areas, a, b, c, and d. The surcharge pressures for the combined sub-areas a+d and b+c are determined, and then for the

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sub-areas c and d. The surcharge pressure is the sum of the surcharge sub-areas a+d and b+c, less the imaginary sub-areas c and d.

	Sub-area			
	ad	*bc*	*c*	*d*
M	10	10	4	4
N	5	5	5	5
M/H	2.0	2.0	0.8	0.8
N/H	1.0	1.0	1.0	1.0
I	0.200	0.200	0.160	0.160
P_X	400	400	(320)	(320)
$P_L = 160\ lb/ft^2$				

Vehicular Loads

Wheel loads from trucks, trains, or other vehicles are significant for pipe buried at shallow depths. The pressure on the pipe due to a surface vehicular live load depends on vehicle weight, the tire pressure and size, vehicle speed, surface smoothness, the amount and type of paving, the soil, and the distance from the pipe to the point of loading.

Minimum Cover Depth

Where pipe is to be subjected to vehicular loads, it is recommended to install it under at least one pipe diameter or eighteen inches of cover, whichever is greater. However, for pipe 36" in diameter or larger, this cover depth may not always be available. For these shallow cover cases, special design considerations are required.

Highway Loads

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The most common loading used for design is the H20 highway loading. The American Association of State Highway and Transportation Officials (AASHTO) publishes wheel loadings for standard H and HS trucks as shown in Figures 7-7 and 7-8. A standard H20 truck has a front axle load of 8,000 pounds, and a rear axle load of 32,000 pounds, for a total weight of 40,000 pounds or 20 tons. At the rear axle(s), each wheel load is 0.4 W, where W is the total weight of the truck. The 0.4 W wheel load may be used to represent the load applied by either a single axle or tandem axles. The heaviest tandem axle loads normally encountered on highways are around 40,000 pounds. Occasionally, vehicles may be permitted with loads up to 50 percent higher.

The standard AASHTO wheel loading is a static load. However, a vehicle in motion will strike bumps and increase the downward force. For vehicles on paved roads, impact loading is accommodated by multiplying the static load by an impact factor of 1.5. For unpaved roads, higher impact factors may be required.

Pavement rigidity is an important variable affecting the live load surcharge pressure transmitted to the pipe. Pavement is usually considered as rigid (concrete) or flexible (asphalt). Rigid pavement distributes the load, and tends to transmit less load directly onto the pipe.

Rigid Pavement Highway Loads

For common highway surcharge loading applications, the pressure acting on the pipe can be obtained from a table developed by the American Iron and Steel Institute (AISI), which gives the H20 and HS20 highway surcharge loading on rigid pavement.

The AISI H20/HS20 highway loading assumes that the axle load is equally distributed over two, 18 by 20 inch areas, spaced 72 inches apart, and applied through a 12-inch thick rigid pavement. To account for speed, an impact factor of 1.5 is incorporated in the table values shown in Table 7-3, next page. For other

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Figure 7-7 **AASHTO Standard H20 Static Loading**

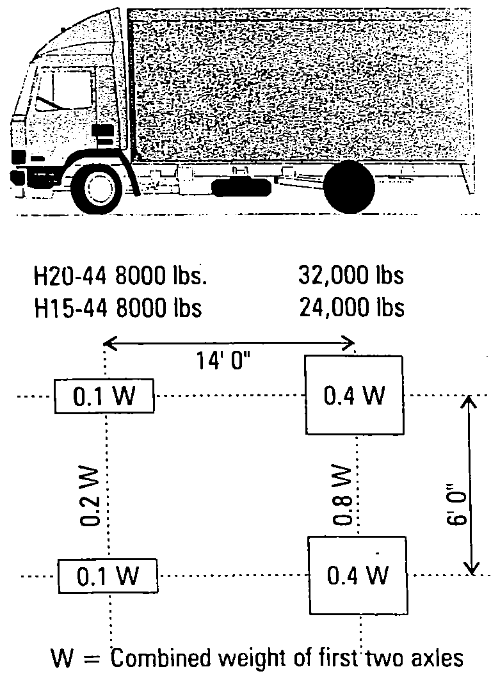


Table 7-3 **H20 and HS20 Highway Loading (AISI)**

Cover, ft	Transferred Load, lb/ft^2
1	1800
2	800
3	600
4	400
5	250
6	200
7	175
8	100
10	†

Simulates 20 ton truck traffic + impact.
†Negligible live load influence.

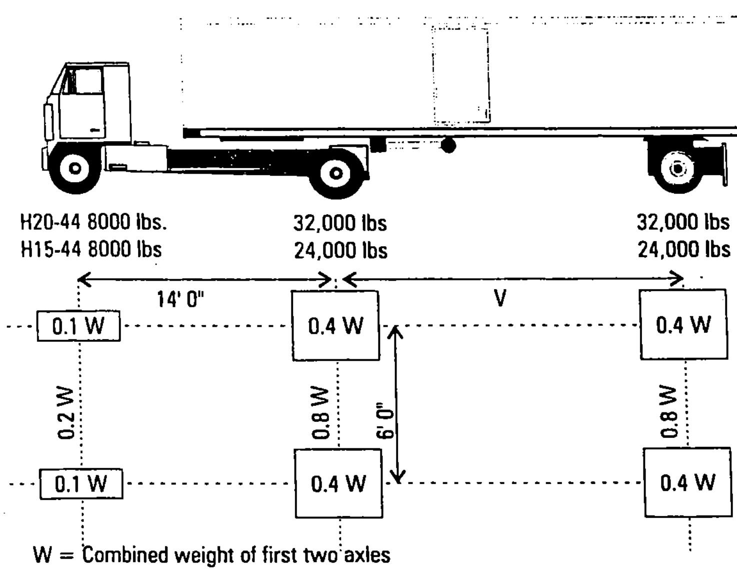
loadings, such as heavier trucks, or trucks on unpaved surfaces the AISI table cannot be used and one of the methods discussed below should be considered.

Off-Highway and Unpaved Road Loads

Off-highway vehicles may be considerably heavier than H20 or HS20 trucks, and these vehicles frequently operate on unpaved roads which may have uneven surfaces. Thus impact factors higher than 1.5 may be reached depending on the vehicle speed. Except for slow traffic, an impact factor of 2.0 to 3.0 should be considered.

During construction, both permanent and temporary underground pipelines may be subjected to heavy vehicle loading from construction equipment. A designated vehicle crossing with special de-

Figure 7-8 **AASHTO Standard HS20 Static Loading**



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sign measures such as temporary pavement or structural sheeting may be advisable, as well as vehicle speed controls to limit impact loading.

Vehicular Loads As Point Loads

There are generally two approaches for calculating vehicle live load surcharge pressure. The more conservative approach is to treat the wheel load as a concentrated (point) load. The other is to treat it as a distributed load spread over the contact area of the tire with the ground (imprint area). The pressure due to a distributed load and the pressure due to a concentrated load begin to approach the same value at a depth of about twice the square root of the loaded area.

The distributed load method gives more realistic values where the depth equals less than twice the square root of the loaded area, whereas for deeper depths concentrated loads are preferred because the calculations are simpler and typically more conservative.

The pressure distribution under a concentrated load varies with depth as illustrated in Figure 7-9. When the live load is calculated using the point load methods given in the following sections, the maximum pressure occurring at the crown is assumed to be distributed across the entire pipe, which gives additional conservatism.

A key consideration in the determination of the live load pressure on the pipe is the location of the wheels relative to the pipe. A higher pressure may occur beneath a point between two vehicles passing in adjacent lanes than directly under a single vehicle wheel. This depends on the depth of cover.

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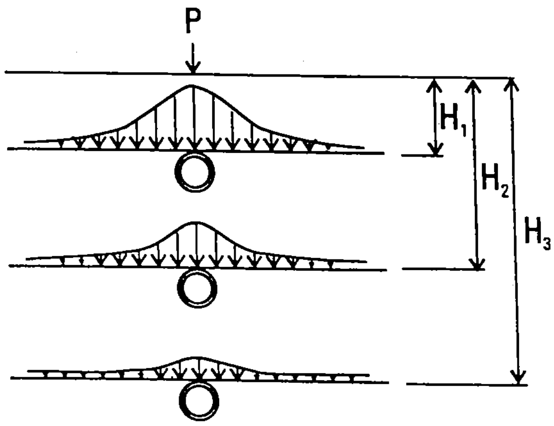
When depths are greater than four or five feet, the combined H20 load for two separate wheels straddling the pipe is greater than that for a single wheel di-

Figure 7-9 Concentrated Load Pressure Distribution at Various Depths



rectly over the pipe. Deeper than five feet, H20 loads are not usually significant because the load is attenuated significantly compared loads under one or two feet of cover. However, greater live loads may produce design significant effects at depths greater than five feet. Therefore, the designer should check load conditions for a single wheel directly over the pipe, and for two wheels spaced six feet apart and centered over the pipe.

Single Wheel Load Centered On Pipe

To check a single wheel load centered directly over the pipe, a method based on Holl's integration of Boussinesq's equation assumes the wheel load is a concentrated (point) load. Holl's integration finds the pressure at the pipe crown depth that is distributed over a surface three feet long, and the width of the pipe outside diameter.

Holl's Integration

Holl's equation for the average vertical pressure acting on a pipe due to a concentrated surface load is given by:

Holl's Equation

$$P_L = C_H \frac{I_l W_L}{LD} \qquad \textbf{(7-11)}$$

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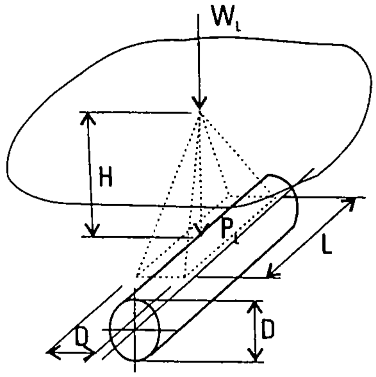
Table 7-4 **Load Coefficient, C_H, for Holl's Integration of Boussineq's Equation**



D/2H	L/2H						
	0.1	0.2	0.3	0.4	0.5	0.6	0.7
0.1	0.019	0.037	0.053	0.067	0.079	0.089	0.097
0.2	0.037	0.072	0.103	0.131	0.155	0.174	0.189
0.3	0.053	0.103	0.149	0.190	0.224	0.252	0.274
0.4	0.067	0.131	0.190	0.241	0.284	0.320	0.349
0.5	0.079	0.155	0.224	0.284	0.336	0.379	0.414
0.6	0.089	0.174	0.252	0.320	0.379	0.428	0.467
0.7	0.097	0.189	0.274	0.349	0.414	0.467	0.511
0.8	0.103	0.202	0.292	0.373	0.441	0.499	0.546
0.9	0.108	0.211	0.306	0.391	0.463	0.524	0.574
1.0	0.112	0.219	0.318	0.405	0.481	0.544	0.597
1.2	0.117	0.229	0.333	0.425	0.505	0.572	0.628
1.5	0.121	0.238	0.346	0.442	0.525	0.596	0.655
2.0	0.124	0.244	0.355	0.454	0.540	0.613	0.674
20.0	0.127	0.248	0.361	0.462	0.550	0.625	0.688

D/2H	L/2H						
	0.8	0.9	1.0	1.2	1.5	2.0	20.0
0.1	0.103	0.108	0.112	0.117	0.121	0.124	0.127
0.2	0.202	0.211	0.219	0.229	0.238	0.244	0.248
0.3	0.292	0.306	0.318	0.333	0.346	0.355	0.361
0.4	0.373	0.391	0.405	0.425	0.442	0.454	0.462
0.5	0.441	0.463	0.481	0.505	0.525	0.540	0.550
0.6	0.499	0.524	0.544	0.572	0.596	0.613	0.625
0.7	0.546	0.574	0.597	0.628	0.655	0.674	0.688
0.8	0.584	0.615	0.639	0.674	0.703	0.725	0.740
0.9	0.615	0.647	0.673	0.711	0.743	0.766	0.783
1.0	0.639	0.673	0.701	0.740	0.775	0.800	0.818
1.2	0.674	0.711	0.740	0.783	0.821	0.849	0.871
1.5	0.703	0.743	0.775	0.821	0.863	0.895	0.920
2.0	0.725	0.766	0.800	0.849	0.895	0.930	0.960
20.0	0.740	0.783	0.818	0.871	0.920	0.960	1.000

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where

P_L = load, lbs/ft^2

I_I = impact factor

W_L = wheel load, lb

C_H = load coefficient from Table 7-4, next page

L = pipe length, ft

D = pipe OD, ft

If the pipe is longer than 3 ft, usual practice is to assume a length of 3 ft. C_H is found in Table 7-4 as a function of D/2H and L/2H where H = depth of cover.

Example 7-4

Find the single H20 rear wheel live load surcharge pressure on a 30" OD PLEXCO pipe buried 4 feet deep. Assume an impact factor of 1.5.

Solution: Use Equation (7-11), Table 7-4, and Figure 7-7. To solve Equation (7-11), the load coefficient, C_H, from Table 7-4 is required. For 4 ft of cover, D/2H = 0.31, and L/2H = 0.38. Interpolating Table 7-4 for C_H yields 0.189. From Figure 7-7, the H20 rear wheel live load is 0.4 x 40,000 = 16,000 lb. Solving equation (7-11) yields:

$$P_L = (0.187)\frac{(1.5)(16{,}000)}{3\left(\frac{30}{12}\right)}$$

$$P_L = 598\ lb/ft^2$$

Multiple Wheel Loads Along Pipe Length

In many cases, the maximum load on the pipe occurs when a single (or dual) wheel is located directly over the pipe. However, at some depths the combined load due to more than one wheel may be larger than the single wheel load. This usually occurs at a location along the pipe which is not directly under a wheel load. This point (Figure 7-10, Case I, Point 2, next column) will usually be centered between two wheel loads.

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Point Load on Pipe Crown

The Boussinesq point load equation may be used to find the wheel load pressure on the pipe, neglecting any pavement effects. Pavement effects are covered later using a modified form of Boussinesq's equation.

Boussinesq's Equation

$$P_L = \frac{3\,I_I\,W_L\,H^3}{2\pi\,r^5} \qquad \textbf{(7-12)}$$

where

P_L = vertical surcharge pressure at pipe crown, lb/ft^2

I_I = impact factor

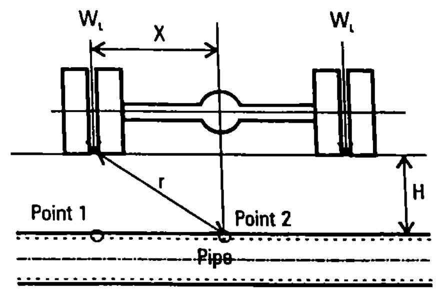
W_L = wheel load, lb

H = vertical depth to pipe crown, ft

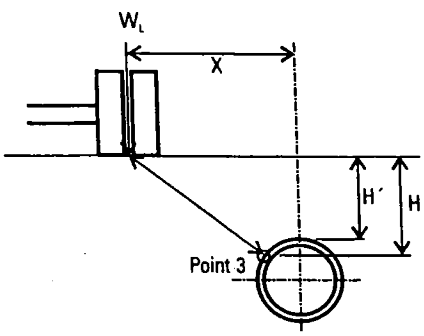
r = distance from the point of load application to pipe crown, ft

$$r = \sqrt{X^2 + H^2} \qquad \textbf{(7-13)}$$

Figure 7-10 **Concentrated Point Load**



Case I: Load Along Pipe Length



Case II: Load At Horizontal Distance From Pipe

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Using the Boussinesq point load equation in this way is conservative, as the pressure applied to the point on the pipe crown is taken as the pressure applied across the pipes diameter.

Equation (7-12) applies only where the axle is located directly over the pipe, and when seeking the pipe crown load at some point between the wheel. This is pictured as Figure 7-10, Case I.

Example 7-5

Determine the vertical soil pressure exerted on a 12" pipe buried 2 ft deep when two 16,000 lb wheel loads cross simultaneously over the pipe. Assume the loads are 6 feet apart. (Six feet is the typical wheel spacing on an axle, and the normal separation for wheel loads traveling in adjacent lanes.)

Solution: Use Equations (7-12) and (7-13), and since the wheels are traveling, a 1.5 impact factor is applied. The maximum load will be at the center between the two wheels, so X = 3 ft. Determine r from Equation (7-13).

$$r = \sqrt{2^2 + 3^2} = 3.61\,ft$$

Then solve Equation (12) for P_L.

$$P_L = \frac{3\,(1.5)\,(16{,}000)\,(2)^3}{2\,\pi\,(3.61)^5}$$

$$P_L = 149.5\,lb/ft^2$$

This is the load from each wheel, however, the load on the pipe crown is from both wheels, so

$$2\,P_L = 2\,(149.5) = 299\,lb/ft^2$$

Point Load Not On Pipe Crown

With some modification of equation terms, the pressure at a point other than at the pipe crown may be determined. A pipe buried along a road shoulder would be such an application. Pictorially, this is Figure 7-10, Case II. For this application, H and r are determined using the following equations:

$$\alpha = tan^{-1}\left(\frac{X}{H' + \frac{D}{2}}\right) \qquad \textbf{(7-14)}$$

$$H = H' + \frac{D}{2}\,(1 - cos\,\alpha) \qquad \textbf{(7-15)}$$

$$r = \sqrt{X^2 + \left(H' + \frac{D}{2}\right)^2} - \frac{D}{2} \qquad \textbf{(7-16)}$$

where

X = horizontal distance from live load to pipe crown, ft

H′ = depth of cover, ft

Multiple Wheel Loads on Rigid Pavement

The Portland Cement Association method may be used to find the load on a pipe from multiple wheel loads on rigid pavement. The solution accounts for pavement rigidity, and the stiffness of the pipe embedment soil. To determine the maximum load when two vehicles pass each other, two common cases are checked. The first calculates the load directly under a wheel, and the other calculates the combined load of two passing vehicles. Usually the later case gives the highest load.

The pressure at a point beneath a single wheel is given by:

$$P_L = \frac{C\,I_f\,W_L}{(R_S)^2} \qquad \textbf{(7-17)}$$

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where

C = load coefficient from Table 7-4, page 49

R_S = radius of stiffness, ft

$$R_S = \frac{\sqrt[4]{\dfrac{E\,h^3}{12\,(1-v^2)\,E'}}}{12} \tag{7-18}$$

where

E = pavement modulus, lb/in^2
(4,000,000 lb/in^2 for concrete)

h = pavement thickness, in

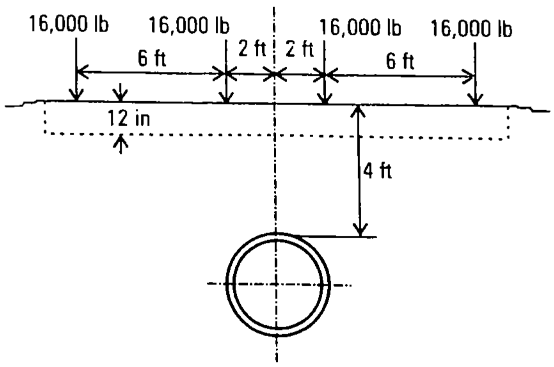
v = Poisson's ratio (0.15)

E′ = embedment soil modulus, lb/in^2 (300-700 psi)

Example 7-6

Find the pressure at the crown of the pipe shown in Figure 7-11, below, with an impact factor of 1.5. Pavement is 12" thick and the pipe is 4 feet below the pavement surface. Assume E′ = 700 lb/in^2

Figure 7-11 **Illustration for use with Example 7-6**



Solution: Using Equation (7-18), solve for R_S, then determine C from Table 7-5, page 53. Use Equation (7-17) and solve for each wheel load. Sum the four wheel load pressures for the total pressure on the pipe.

$$R_S = \frac{\sqrt[4]{\dfrac{(4{,}000{,}000)\,(12)^3}{12\,(1-0.15^2)\,(700)}}}{12}$$

$$R_S = 2.52\,ft$$

	Outer	Inner
X/Rs	8/2.52 = 3.2	2/2.52 = 0.8
H/Rs	4/2.52 = 1.6	4/2.52 = 1.6
C	0.011	0.054

Since the loads are cumulative, it is convenient to add the load coefficients together, then solve for the pressure on the pipe in one calculation.

$$C_{TOTAL} = 2\,(0.011 + 0.054) = 0.13$$

$$P_L = \frac{(0.13)\,(1.5)\,(16{,}000)}{2.52^2}$$

$$P_L = 492\,lb/ft^2$$

Vehicular Loads As Distributed Loads

The concentrated load methods presented above typically provide more conservative results than distributed load methods, and should be satisfactory for most applications. However, with shallow cover and heavy load concentrated load methods may give answers that are unrealistically conservative. In this event or where a more precise answer is sought, pipe loading pressure may be evaluated using distributed load methods.

Distributed Wheel Loads

The methods above for determining the pressure due to a stationary distributed load can be applied to a wheel load as well, provided that the dimensions of the area loaded by the wheel are known. Allowing for traveling vehicle impact, and

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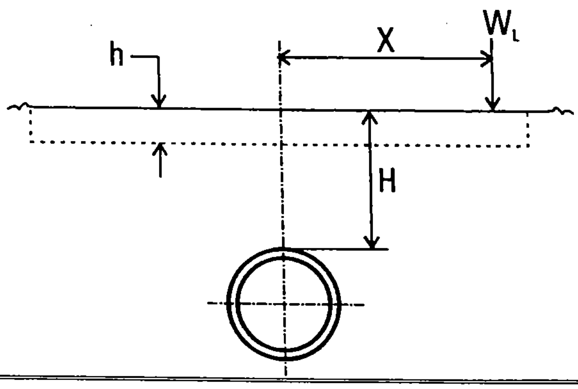
Table 7-5 Pressure Coefficient, C, for Single Load



H/Rs	X/Rs										
	0.0	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.0
0.0	0.113	0.105	0.089	0.068	0.048	0.032	0.020	0.011	0.006	0.002	0.000
0.4	0.101	0.095	0.082	0.065	0.047	0.033	0.021	0.011	0.004	0.001	0.000
0.8	0.089	0.084	0.074	0.061	0.045	0.033	0.022	0.012	0.005	0.002	0.001
1.2	0.076	0.072	0.065	0.054	0.043	0.032	0.022	0.014	0.008	0.005	0.003
1.6	0.062	0.059	0.054	0.047	0.039	0.030	0.022	0.016	0.011	0.007	0.005
2.0	0.051	0.049	0.046	0.042	0.035	0.028	0.022	0.016	0.011	0.008	0.006
2.4	0.043	0.041	0.039	0.036	0.030	0.026	0.021	0.016	0.011	0.008	0.006
2.8	0.037	0.036	0.033	0.031	0.027	0.023	0.019	0.015	0.011	0.009	0.006
3.2	0.032	0.030	0.029	0.026	0.024	0.021	0.018	0.014	0.011	0.009	0.007
3.6	0.027	0.026	0.025	0.023	0.021	0.019	0.016	0.014	0.011	0.009	0.007
4.0	0.024	0.023	0.022	0.020	0.019	0.018	0.015	0.013	0.011	0.009	0.007
4.4	0.020	0.020	0.019	0.018	0.017	0.015	0.014	0.012	0.010	0.009	0.007
4.8	0.018	0.017	0.017	0.016	0.015	0.013	0.012	0.011	0.009	0.008	0.007
5.2	0.015	0.015	0.014	0.014	0.013	0.012	0.011	0.010	0.008	0.007	0.006
5.6	0.014	0.013	0.013	0.012	0.011	0.010	0.010	0.009	0.008	0.007	0.006
6.0	0.012	0.012	0.011	0.011	0.010	0.009	0.009	0.008	0.007	0.007	0.006

wheel load over a known area, Equation (7-9) becomes

$$P_L = 4\, I_C \left(\frac{I_I\, W_L}{A_C} \right) \qquad \textbf{(7-19)}$$

where

P_L = surcharge load pressure on pipe crown, lb/ft^2

I_C = influence coefficient from Table 7-2, page 43

I_I = impact factor

W_L = wheel load, lb

A_C = contact area, ft^2

Load Areas

A literature search provides guidelines for wheel load areas. AISI gives dual wheel contact area for rear axle on an H20 or HS20 vehicle, as an 18 in by 20 in rectangle. For a single tire, AASHTO assumes that the tire imprint area is a rectangle with an area in square inches

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equal to $0.01W_L$, where W_L is the wheel load in lbs. The AASHTO area has 1:2.5 ratio of direction-of-traffic length to tire width. The contact area may also be found by dividing the wheel load by the tire pressure. For off road and heavy trucks, the tire contact area should be obtained from the vehicle manufacturer.

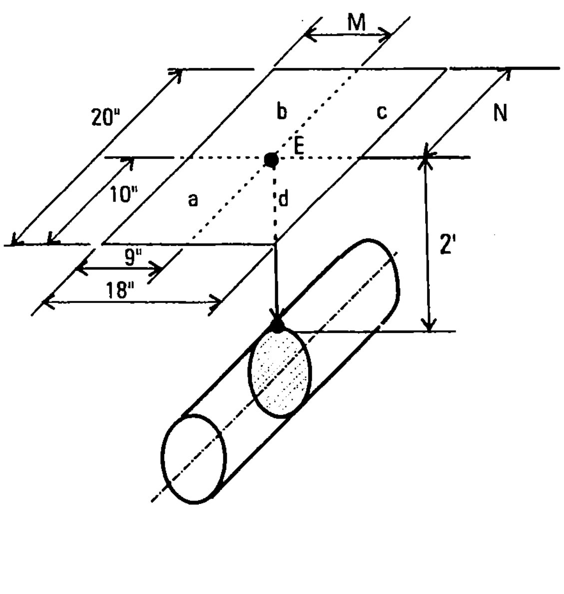
Example 7-7

(a) Using the distributed load method, find the pressure at the crown of a 24" O.D. polyethylene pipe with 2 ft of cover under an HS20 vehicle with a 16,000 lb wheel load and an impact factor of 1.5. Assume the AISI contact area for a dual tire rear wheel.

(b) Compare this value with that obtained using the Boussinesq point load equation.

Solution: (a) The vertical pressure at the crown of the pipe may be found using Equation (7-19), and Table 7-2, page 43. The live load is divided into four equal areas, with the common corner centered over the pipe as shown in Figure 7-12.

Figure 7-12 **Illustration for use with Example 7-7**



$$\frac{M}{H} = \frac{9/12}{2} = .375$$

$$\frac{N}{H} = \frac{10/12}{2} = 0.42$$

y interpolation of Table 7-2, the influence coefficient is 0.059, so

$$P_L = 4(0.059)\frac{(1.5)(16{,}000)}{\left(\frac{18}{12}\right)\left(\frac{20}{12}\right)}$$

$$P_L = 2265\ lb/ft^2$$

(b) To determine the point load, Equations (7-12) and (7-13) apply. Since the load is directly above the pipe, r = H = 2 ft, and

$$P_L = \frac{3\,(1.5)\,(16{,}000)\,(2^3)}{2\,\pi\,(2^5)}$$

$$P_L = 2865\ lb/ft^2$$

Timoshenko's Method

The Timoshenko method is a conservative approach which finds the stress at a point in the soil under a distributed wheel load. The pressure acting at the crown of a buried pipe may be calculated using the following:

Timoshenko's Equation

$$P_L = \frac{I_l W_L}{A_C}\left(1 - \frac{H^3}{(r_T^2 + H^2)^{1.5}}\right) \qquad \textbf{(7-20)}$$

where

P_L	=	vertical stress acting on pipe crown, lb/ft^2
I_l	=	impact factor
W_L	=	wheel load, lb
A_C	=	contact area, ft^2
r_T	=	equivalent radius, ft
H	=	depth to pipe crown, ft

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For standard H20 and HS20 highway vehicle loading, the contact area is normally taken for dual wheels, that is, 16,000 lb over an 18 in by 20 in area. The equivalent radius is given by:

$$r_T = \sqrt{\frac{A}{\pi}} \qquad (7\text{-}21)$$

Example 7-8

Find the vertical pressure on a 24" polyethylene pipe buried 3 ft beneath an unpaved road when an R-50 truck is over the pipe. The manufacturer lists the truck with a gross weight of 183,540 lbs on 21X35 E3 tires, each having a 30,590 lb load over an imprint area of 370 in^2.

Solution: Use Equations (7-20) and (7-21). Since the vehicle is operating on an unpaved road, an impact factor of 2.0 is appropriate.

$$r_T = \sqrt{\frac{370/144}{\pi}} = 0.90\,ft$$

$$P_L = \frac{(2.0)(30{,}590)}{\frac{370}{144}}\left(1 - \frac{3^3}{(0.90^2 + 3^2)^{1.5}}\right)$$

$$P_L = 2890\,lb/ft^2$$

Railroad Loads

Figure 7-13 and Table 7-6 presents Cooper E80 live loading based on AISI published information for three, 80,000 lb loads over 2 ft x 8 ft areas on 5 ft centers. Commercial railroads frequently require casings for plastic pipes if they are within 25 feet of the tracks. However, at sufficient depth, smaller diameter pipes, and pipes carrying non-hazardous fluids may safely withstand design loads without encasement. Based upon design and permitting requirements, the design engineer should determine whether or not a casing is required.

Figure 7-13 **Cooper E80 Live Loading**

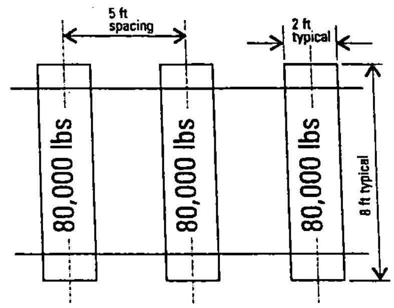

Table 7-6 **Cooper E80 Live Loading**

Height of Cover (ft)	*Load (psf)*
2	3800
5	2400
8	1600
10	1100
12	800
15	600
20	300
30	100

Designing Buried Polyethylene Pipes to Withstand Loads

Polyethylene pipes are subjected to stress from the combination of internal and external forces applied to the pipe. The most common internal force is fluid pressure. For buried pipes, the most common external forces are earth and surcharge loads. This section discusses pipe stresses and deformations due to external forces. Internal pressure stress may increase or decrease stresses or deformations from external forces.

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External Forces On Buried Pipe

Buried pipe are subjected to radially directed compressive loads and to circumferential shear loads from the surrounding soil and surcharge loads. Radially directed loads are loads that are applied to the pipe wall and have a line of action passing through the center of the pipe. These loads will produce stresses and deformations in the pipe. Radial loads will cause a minute decrease in the pipes diameter.

Normally, a radially directed load is not uniform, and this causes the pipe to undergo ring deflection. The amount of ring deflection will depend on the load, pipe stiffness, and soil stiffness. When buried in very weak, viscous soils that offer little or no stiffness compared to the pipe, the ring deflection of the pipe will be governed almost entirely by pipes properties. On the other hand, when buried in compacted granular embedment, the ring deflection is governed by the interaction between the pipe and the surrounding soil.

In buried applications, polyethylene pipe is usually characterized by ring stiffness measures such as RSC (Ring Stiffness Constant) or PS (pipe stiffness), ductility (which governs permissible deflection limits), and compressive strength. Soil stiffness is usually characterized by the modulus of passive resistance, a measure of the combined stiffness of the pipe and the soil, and related to the soil's compressibility and density.

The radial compressive loads and the ring deflection, or bending that occurs in a flexible pipe, causes deformations and stresses in the pipe wall. Some of the more common design concerns for buried flexible pipe are presented below. All designs should be reviewed by an engineer to determine their suitability for a particular application.

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Wall Compressive Stress

When a non-pressurized pipe, confined in a dense embedment, is subjected to a radially directed soil pressure, a circumferential, compressive thrust occurs in its wall. This is similar to the thrust force that occurs within the wall of a ring when it is squeezed. This thrust creates a ring (or hoop) compressive stress within the pipe wall, which is analogous to the hoop tensile stress created by internal pressure, but with an opposite sign.

As is often the case, the radial soil pressure causing the stress is not uniform. However, for wall compressive stress calculation convenience, it is commonly assumed that the radial soil pressure is uniform and equal to the vertical soil pressure at the crown of the pipe.

When pressure pipe is buried, the internal pressure may be greater than the radial external pressure applied by the soil. This results in a tensile stress rather than a compressive stress in the pipe wall. So, wall compressive stresses are normally not considered for pressure pipe. (This can be checked by calculating the wall compressive stress and comparing it with the hoop stress due to internal pressure.)

The compressive stress in the wall of PLEXCO or SPIROLITE pipe subjected to a uniform radial soil pressure is:

(PLEXCO pipe)

$$S = \frac{P_T D_O}{288\,t} \qquad \textbf{(7-22)}$$

(SPIROLITE pipe)

$$S = \frac{P_T D_O}{288\,A} \qquad \textbf{(7-23)}$$

where

P_T = vertical load applied to pipe, lbs/ft^2

S = pipe wall compressive stress, lb/in^2

t = wall thickness, in

A = wall profile average cross-sectional area, in^2/in

D_O = pipe outside diameter, in

As arching commonly occurs for entrenched pipe, the modified arching load rather than the prism load is used to determine the vertical soil pressure at the pipes crown.

The pipe wall compressive stress should be compared to an allowable material stress value which should be determined by testing. The recommended, long-term compressive strength design value for Plexco/Spirolite polyethylene pipes is 800 lb/in^2.

Example 7-9

Find the pipe wall compressive ring (or hoop) stress in a SPIROLITE 36" Class 100 pipe buried under 18 ft of cover. The ground water level is at the surface, the saturated weight of the insitu silty-clay soil is 120 lbs/ft^3, and the trench width equals the pipe diameter plus 3 ft.

Solution: Determine the modified arching load using Equation (7-5), page 41. The arching coefficient may be found using Equation (7-6), page 41, or from Figure 7-4, page 44 as

$$F = 0.83$$

Although the net soil pressure is equal to the buoyant weight of the soil, the water pressure is also acting on the pipe. Therefore the total pressure (water and earth load) can be found using the saturated unit weight of the soil.

$$P_C = (0.83)(120)(18)$$

$$P_C = 1793\ lb/ft^2$$

Next, solve Equation (7-23) for the compressive stress. For SPIROLITE 36" Class 100 pipe, the wall cross sectional area, A, and outside diameter, D_O, are found in SPIROLITE product literature. A is 0.470 in^2/in, and D_O is 36 plus twice the 2.02" wall height, or 40.04 in.

$$S = \frac{1793\,(40.04)}{288\,(0.470)}$$

$$S = 530\ lb/in^2$$

The application is within the 800 lb/in^2 allowable stress guideline.

Unconstrained Pipe Wall Buckling

Flexible pipe may be considered to have the cross section of a long, slender column rolled into a circle. Compressive thrust, in combination with radially directed forces, may cause an instability or buckling, that is, a large wrinkle or dimple in the pipe wall. This type of deflection can be compared to the Euler buckling of a column.

Compared to its capacity for tensile wall stress from internal pressure, unconstrained flexible pipe has less resistance to external, radially-directed pressure. Examples of external pressures on unconstrained pipe are: external atmospheric pressure from a vacuum within the pipe; external hydrostatic load such as groundwater above a slipliner, or a partially full underwater pipeline; column separation of the flow in a downhill pipeline; siphoning, or a reduced internal pressure where a liquid line crests a rise; and cavitation due to pump shut-off or start-up. If an unconstrained pipe will be subjected to an external pressure during

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service, the unconstrained buckling resistance should be checked.

For unconstrained (not buried) pipe, the critical negative pressure or external pressure above which buckling can occur may be estimated by:

$$P_{CR} = \frac{24\,E\,I}{(1-\mu^2)\,D_M^3} \qquad (7\text{-}24)$$

where

P_{CR} = critical external collapse pressure, lb/in^2

E = elastic modulus, lb/in^2

I = SPIROLITE profile wall moment of inertia, in^4/in

μ = Poisson's ratio

D_M = mean diameter

PLEXCO Pipe

$$D_M = D_0 - 1.06t \qquad (7\text{-}25)$$

SPIROLITE Pipe

$$D_M = D_I + 2Z \qquad (7\text{-}26)$$

D_I = inside diameter, in

D_O = outside diameter, in

Z = SPIROLITE wall centroid, in

t = PLEXCO minimum wall thickness, in

Poisson's ratio, μ, is 0.45 for long-term loading on polyethylene pipe, and 0.35 for short-term loading. Expressing critical external buckling pressure in terms of DR for PLEXCO pipe, Equation (24) becomes

$$P_{CR} = \frac{2\,E}{(1-\mu^2)}\left(\frac{1}{DR-1}\right)^3 \qquad (7\text{-}27)$$

where terms are as above, and

DR = PLEXCO pipe dimension ratio

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Ovality Effects

Ovality or deflection of the pipe diameter will increase the bending moment in the pipe wall and thus reduce buckling resistance.

$$P = f_0\,P_{CR} \qquad (7\text{-}28)$$

where

f_0 = ovality compensation factor from Figure 7-14, below

P = buckling pressure, lb/in^2

Pipe deflection is determined by

$$\%DEFLECTION = 100\left(\frac{D - D_D}{D}\right) \qquad (7\text{-}29)$$

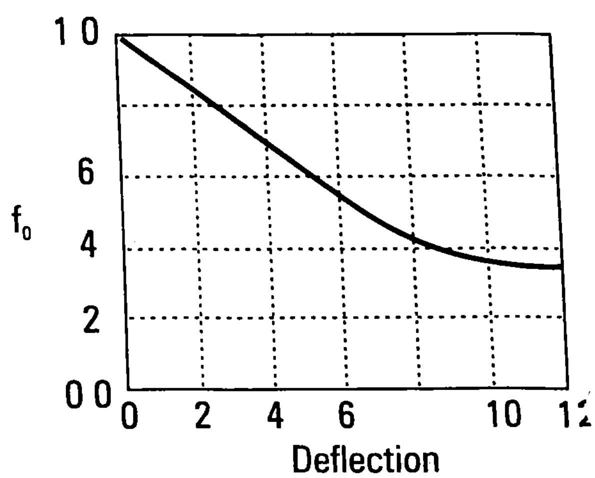
where

D = pipe average diameter, in

D_D = pipe minimum diameter, in

The elastic material properties used for calculating critical buckling pressure should be appropriate for the specific application. See Chapter 5, *Thermal Effects,* Table 5-1, Time and Temperature Elastic Modulus, page 25.

Figure 7-14 Ovality Compensation Factor for Unconstrained Buckling



The designer should compare the critical buckling pressure with the actual anticipated pressure, and apply a safety factor commensurate with his assessment of the application. Safety factors in the range of 2.5 to 1 are common, but specific circumstances may warrant a higher or lower safety factor. An alternative to a direct safety factor may be to apply a longer term elastic modulus to a short term stress event.

The resilience and toughness of PLEXCO and SPIROLITE pipe may allow the pipe to recover from a temporary buckling or flattening event. For example, a high SDR, unconstrained PLEXCO pipe may be pressed flat by a short duration vacuum inside the pipe, but relieving the vacuum can allow the pipe to recover most of its original round shape. In most cases, there will not be loss of serviceability or permanent damage. If temporary buckling events are possible with SPIROLITE pipe, bell and spigot joints should be welded, otherwise, joint sealing capability may be lost.

Example 7-10

Find the allowable ground water level above a 24" Class 160 SPIROLITE pipe installed in a casing without grout in the annular space. Consider the case where the pipe is below the normal water table, and where the water table rises during a flood.

Solution: Use Equations (7-24) and (7-26); Bulletin No. 910, *ASTM F 894 High Density Polyethylene Pipe Product Data;* Figure 7-1, page 38; and, for elastic modulus values, Table 5-1, page 25. The critical external collapse pressure depends upon the duration of the water level above the pipe. If the water level is constant, then a long term elastic modulus should be used, but if the water level rises only occasionally, a shorter term elastic modulus may be applied.

Bulletin No. 910 provides pipe dimensions and I values. For 24" Class 160 pipe, I is 0.124 in^4/in and Z, the wall centroid, is 0.50 in.

$$D_M = 24 + 2(0.50) = 25.0\ in$$

For the constant water table above the pipe, the 50 year, 73°F modulus is 28,200 lb/in^2, and

$$P_{CR} = \frac{24(28{,}200)(0.124)}{(1-0.45^2)(25.0^3)}$$

$$P_{CR} = 6.79\ lb/in^2$$

Assuming 5% ovality, and a 2 to 1 safety factor, Figure 1 provides f_O as 0.64, and

$$P = \frac{(0.64)(6.79)}{2}$$

$$P = 2.17\ lb/in^2 = 5.0\ ft\ H_2O$$

Flooding conditions are occasional happenings, usually lasting a few days to a week or so. The 1000 hour (41.6 days) elastic modulus value is about double the expected flood duration, so it provides about a 2 to 1 safety margin. Solving as above,

$$P_{CR} = \frac{24(43{,}700)(0.124)}{(1-0.45^2)(25^3)}$$

$$P_{CR} = 10.44\ lb/in^2$$

$$P = (0.64)(10.44)$$

$$P = 6.68\ lb/in^2 = 15.4\ ft\ H_2O$$

Constrained Pipe Wall Buckling

Buckling resistance is increased when flexible pipe is embedded in soil, as the soil and pipe are coupled together to re-

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sist buckling forces. A vertically applied thrust force causes the pipe to widen horizontally, and the soil restrains horizontal pipe deflection, thus forcing the pipe into a higher order buckling mode. When embedded in soil, the pipes critical buckling pressure increases. This pipe/soil interaction occurs when the depth of cover is sufficient to mobilize soil support. A publication by the American Water Works Association, AWWA C-950, indicates that at least four feet of cover is required.

AWWA C-950 provides a design equation for buckling of a buried plastic pipe. The following constrained pipe buckling equation is applicable to PLEXCO and SPIROLITE pipe.

PLEXCO Pipe

$$P_{WC} = \frac{5.65}{N}\sqrt{R\,B'\,E'\,\frac{E}{12\,(DR-1)^3}} \qquad (7\text{-}30)$$

SPIROLITE Pipe

$$P_{WC} = \frac{5.65}{N}\sqrt{R\,B'\,E'\,\frac{E\,I}{D_M^3}} \qquad (7\text{-}31)$$

where

P_{WC} = allowable constrained buckling pressure, lb/in^2

N = safety factor

R = buoyancy reduction factor

$$R = 1 - 0.33\,\frac{H'}{H} \qquad (7\text{-}32)$$

H′ = groundwater height above pipe, ft

H = cover height, ft

B′ = elastic support factor

$$B' = \frac{1}{1+4e^{(-0.065\,H)}} \qquad (7\text{-}33)$$

e = natural log base number, 2.71828

E′ = soil reaction modulus, lb/in^2

E = pipe material elastic modulus, lb/in^2

I = pipe wall moment of inertia, in^4/in

D_M = mean diameter, in

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The designer should apply a safety factor commensurate with the application. A safety factor of 2.0 has been used for thermoplastic pipe.

The allowable constrained buckling pressure should be compared to the total vertical stress acting on the pipe crown from the combined load of soil, and groundwater or flood water. It is prudent to check buckling resistance against a groundwater level for a 100-year-flood. In this calculation the total vertical stress is typically taken as the prism load pressure for saturated soil, plus the fluid pressure of any flood water above the ground surface.

Example 7-11

Find the allowable buckling pressure for a SPIROLITE 36" Class 100 36" pipe, installed in compacted soil embedment which develops an E′ of 2000 lb/in^2. Is Class 100 pipe sufficient for an applied load from 18 feet of cover and ground water to the surface?

Solution: Solve Equation (7-29) using Equations (7-26), (7-32), (7-33), and Table 5-1. SPIROLITE pipe dimensions and properties are found in product publications. For SPIROLITE 36" Class 100 pipe, I is 0.171 in^4/in, and Z is 0.58 in. Solve for terms D_M, B, and R.

$$D_M = 36 + 2\,(0.58) = 37.16\ in$$

$$B' = \frac{1}{1+4e^{-(0.065)(18)}}$$

$$B' = 0.446$$

$$R = 1 - 0.33\,\frac{18}{18} = 0.67$$

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Under the specified 100-year-flood condition, soil cover, H, and flood water height, H′, are both 18 feet.

From Table 5-1, E is 28,200 lb/in^2 for 50 years at 73°F, and common practice is a safety factor of 2. Solving Equation (7-29):

$$P_{WC} = \frac{5.65}{2}\sqrt{\frac{0.67\,(0.446)\,2000\,(28{,}200)\,.171}{37.16^3}}$$

$$P_{WC} = 21.17\,\frac{lb}{in^2} = 3051\,\frac{lb}{ft^2}$$

The load applied to the pipe is found using the prism load, Equation (7-1), page 39. (Note: For this example, the specified soil reaction modulus, E′, is an empirical value that was developed using prism load rather than arching load methods. Therefore, the prism soil load must be used. If a soil reaction modulus value is developed using arching or modified arching methods, then soil loads should be calculated using the appropriate method. See discussions on Soil Reaction Modulus (page 62) and Vertical Soil Pressure (page 63.)

$$P_E = (120)\,(18) = 2160\,\frac{lb}{ft^2}$$

Since the allowable buckling stress is greater than this pressure Class 100 pipe is satisfactory for this installation.

Another design method for determining the buckling resistance of soil constrained pipe is

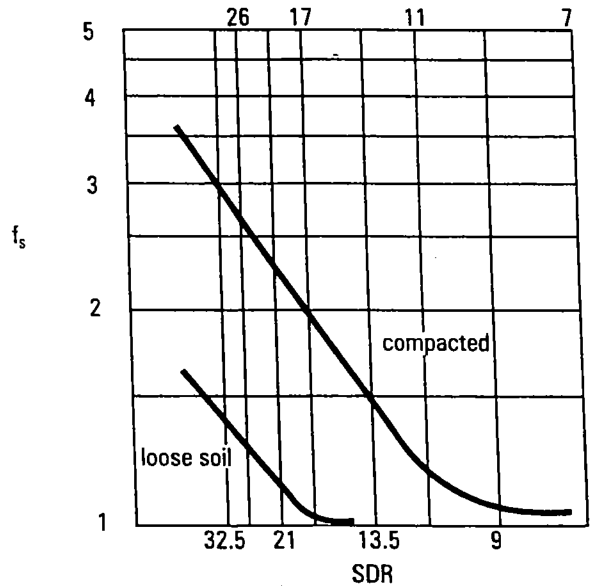
$$P = f_0\, f_S\, P_{CR} \qquad \textbf{(7-34)}$$

where terms are as defined above, and

f_s = support factor from Figure 7-15 for a given soil condition and DR

The constrained pipe buckling pressure for a PLEXCO pipe supported by soil may be found using Equation (7-27), then using Equation (7-34) to adjust the value for ovality and soil support. Figure 7-15 gives the adjustment factors for typical loose soil and compacted soil. For mud or marshlands soil, which give no support, f_s is equal to 1.

Figure 7-15 **Support Factor**



Ring Deflection

Some vertical pipe deflection is desirable to promote arching, and to mobilize the passive soil resistance forces which support the pipe. However, deflection may affect other pipe or system performance areas, such as pipe material long term strain capability, pipeline hydraulic capacity and compatibility with cleaning equipment, and SPIROLITE pipe deflected bell-and-spigot joint sealing capability.

There are two components of buried pipe deflection: construction deflection, and service load deflection. Construction deflection occurs during shipping, handling, and placement of the embedment around the pipe. This includes all forces

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acting on the pipe up to the point of backfill placement above the pipe. Service load deflection occurs when backfill is placed above the pipe, and surcharge loads are applied. The deflection observed in a buried pipe after the completion of an installation is the sum of the construction deflection and the service load deflection.

Several methods are available for calculating the flexible pipe deflection due to earth loads and surcharge loads. Historically, Spangler's Iowa formula has been used to find the deflection of plastic pipes. Other methods include closed form solutions, and numerical methods such as finite element solutions. Alternatives to Spangler's equation may give more accurate values, but they usually require more precise information on soil and pipe properties. So, these methods are not as commonly used as Spangler's equation.

Spangler's Modified Iowa Formula can be written for use with SPIROLITE pipe as:

(7-35)

$$\frac{\Delta X}{D_I} = \frac{P_T}{144}\left(\frac{KL}{\dfrac{1.24\,(RSC)}{D_I} + 0.061\,E'}\right)$$

PLEXCO pipe as:

(7-36)

$$\frac{\Delta X}{\underset{10.03}{D_M}} = \frac{\overset{3722}{P_T}}{144}\left(\frac{\overset{0.1}{K}L}{\dfrac{\overset{28000}{2E}}{3}\left(\dfrac{1}{\underset{17}{DR} - 1}\right)^3 + 0.061\,\underset{1000}{E'}}\right)$$

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where 0.000244

ΔX = horizontal deflection, in

K = bedding factor, typically 0.1

L = deflection lag factor

P_T = pipe crown vertical pressure, lb/ft^2

E = elastic modulus, lb/in^2

E' = soil reaction modulus, lb/in^2

RSC = Ring Stiffness Constant

DR = dimension ratio

D_M = mean diameter, in (Equation (7-25 & 26)

D_I = inside diameter

$$\%DEFLECTION = \frac{\Delta X}{D_I}(100) = \frac{\Delta X}{D_M}(100)$$

Soil Reaction Modulus, E′

The soil reaction modulus is an interactive modulus representing the support or stiffness of the embedment soil in reaction to lateral pipe deflection under load. It is dependent on both soil and pipe properties, so there are no convenient laboratory tests to determine the soil reaction modulus for a given soil.

For the most part the modulus must be determined empirically, that is, it must be found by measuring the deflection of a buried pipe, then substituting that value into Spangler's equation and back-calculating.

Table 7-7 presents soil reaction modulus values from an extensive field study for the Bureau of Reclamation performed by A. Howard. These soil reaction modulus values are commonly used for flexible pipe design.

Howard noted deflection variability along the length of a typical pipeline. To determine maximum deflection, variability should be accommodated by reducing the Table 7-7 E′ value by 25%, or by adding the deflection percentage given in Table 7-7.

As cover depth increases, so does the earth pressure on the embedment material. Both horizontal and vertical pressures exist in a soil mass, but unlike

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water, these pressures are not normally equal to each other. As the enveloping or confining pressure is increased on a granular material, soil grains are held together more tightly, and the entire system stiffens. J. Hartley and J. Duncan published a study of soil reaction modulus variation with depth. Their recommended soil reaction modulus values are presented in Table 7-8, and should be considered when cover depth is less than 20 feet.

The vertical soil pressure exerted on a buried flexible pipe is typically equal to the Marston load. However, the Howard's Bureau of Reclamation E′ values were based on the assumption that the pipe was subjected to the prism load, which means that the arching is incorporated in the E′ values. When using Table 7-7 or Table 7-8, the prism load should be used.

The soil reaction modulus represents the stiffness of the soil surrounding the pipe. In Tables 7-7 and 7-8, E′ values are

Table 7-7 **Bureau of Reclamation Average Values for E′ for Iowa Formula (Initial Deflection)**

Soil type—pipe bedding material (Unified Classification)[1]	*E′ for Degree of Bedding Compaction, lb/in²*			
	Dumped	*Slight: <85% Proctor, <40% relative density*	*Moderate: 85% - 95% Proctor, 40% - 70% relative density*	*High: >95% Proctor, >70% relative density*
Fine-grained Soils (LL > 50)[2] Soils with medium to high plasticity CH, MH, CH-MH	No data available: consult a competent soils engineer, otherwise, use E′ = 0			
Fine-grained Soils (LL < 50) Soils with medium to no plasticity CL, ML, CL-ML, with less than 25% coarse-grained particles	50	200	400	1000
Fine-grained Soils (LL < 50) Soils with medium to no plasticity CL, ML, CL-ML, with more than 25% coarse-grained particles Coarse-grained Soils with Fines GM, GC, SM, SC[3] contains more than 12% fines	100	400	1000	2000
Coarse-grained Soils with Little or No Fines GW, GP, SW, SP[3] contains less than 12% fines	200	1000	2000	3000
Crushed Rock	1000	3000	3000	3000
Accuracy in Terms of Percentage Deflection[4]	±2%	±2%	±1%	±0.5%

1 ASTM D 2487, USBR Designation E-3
2 LL = Liquid Limit
3 Or any borderline soil beginning with one of these symbols (i.e., GM-GC, GC-SC).
4 For ±1% accuracy and predicted deflection of 3%, actual deflection would be between 2% and 4%.

Note: Values applicable only for fills less than 50 ft (15 m). Table does not include any safety factor. For use in predicting initial deflections only; appropriate Deflection Lag Factor must be applied for long-term deflections. If bedding falls on the borderline between tow compaction categories, select lower E′ value, or average the two values. Percentage Proctor based on laboratory maximum dry density from test standards using 12,500 ft-lb/cu ft (598,000 J/m²) (ASTM D-698, AASHTO T-99, USBR Designation E-11). 1 psi = 6.9 KPa.

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Table 7-8 **Duncan-Hartley Soil Reaction Modulus**

Type of Soil	Depth of Cover, ft	E′ for Standard AASHTO Relative Compaction, lb/in²			
		85%	90%	95%	100%
Fine-grained soils with less than 25% sand content (CL, ML, CL-ML)	0 - 5	500	700	1000	1500
	5 - 10	600	1000	1400	2000
	10 - 15	700	1200	1600	2300
	15 - 20	800	1300	1800	2600
Coarse-grained soils with fines (SM, SC)	0 - 5	600	1000	1200	1900
	5 - 10	900	1400	1800	2700
	10 - 15	1000	1500	2100	3200
	15 - 20	1100	1600	2400	3700
Coarse-grained soils with little or no fines (SP, SW, GP, GW)	0 - 5	700	1000	1600	2500
	5 - 10	1000	1500	2200	3300
	10 - 15	1050	1600	2400	3600
	15 - 20	1100	1700	2500	3800

given for the embedment material. However, when the insitu trench soil is highly compressible (marsh clay, peat, saturated organic soils, etc.) compared to the embedment around the pipe, the embedment soil may not develop the E′ values given in the table, and the pipe may deflect more than the design prediction. The effect of highly plastic insitu trench soil may be minimized by increasing the trench width.

Janson recommends the use of the short term pipe elastic modulus value in Spangler's equation. The concept is that soil settlement around the buried pipe occurs in discrete events as soil grains shift or fracture. Once movement occurs, soil arching redistributes the load, and no further deflection occurs for that event. Since these load increments are felt like impulse loads, the pipe resists them with its short term elastic modulus.

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Lag Factor And Long Term Deflection

Long term buried pipe deflection is determined by both pipe and soil properties, as both pipe and soil are subjected to visco-elastic deformations. For a properly installed pipe, soil properties generally prevail.

Visco-elastic deformation can continue forever, but total deformation is typically small. For example, most buildings settle after construction due to soil creep, but rarely does this cause distress. The same is true for most flexible pipe, whether plastic or metal. Visco-elastic deformation typically accounts for only a small percentage of the total deflection of the pipe, and a large portion of this deflection normally occurs within a few weeks after installation.

Research conducted by R. Lytton at Texas A&M University, has shown that for properly installed plastic pipe, long term deflection is controlled principally by the embedment soil.

Spangler recommended addressing visco-elastic effects by using a deflection lag factor in the Iowa Formula. Recommended values range from 1.0 to 1.5.

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Lytton and Brown published time factors based on a visco-elastic solution for long term deflection of pipe installed in saturated clay. The ratio of the 50-year deflection to the 30 day (or short term) deflection gave a lag factor of 1.5. Field measurements of HDPE pipe have confirmed values in the same range.

Example 7-12

Estimate the vertical deflection of a SPIROLITE 36" Class 100 installed under 18 feet of cover. The embedment material is a well-graded sandy gravel, compacted to a minimum 90 percent of Standard Proctor density.

Solution: Use the prism load, Equation (7-1) (page 39), Table 7-7, and Equation (7-35). Table 7-7 gives an E′ for a compacted sandy gravel or GW-SW soil as 2000 lb/in^2. To estimate maximum long-term deflection, this value will be reduced by 25%, or to 1500 lb/in^2. (The Duncan-Hartley value in Table 7-8 for this material with 18 ft of cover is 1700 psi.)

The prism load on the pipe is equal to:

$$P_E = (120)(18) = 2160\, lb/ft^2$$

Substituting these values into Equation (7-35) gives:

$$\frac{\Delta X}{D_I} = \frac{2160}{144}\left(\frac{(0.1)(1.5)}{\frac{(1.24)(100)}{36+2(0.58)} + (0.061)(1500)}\right)$$

$$\frac{\Delta X}{D_I} = 0.0237$$

$$\%DEFLECTION = \frac{\Delta X}{D_I}(100) = 2.37$$

Deflection Limits

Pipe deflection is a natural, essential, response to soil loading. Deflection mobilizes passive resistance in the surrounding soil, and promotes arching. Small deflections are desirable, but large deflections should be limited.

SPIROLITE pipe is manufactured to ASTM F 894 which states that profile pipe designed for 7.5% deflection will perform satisfactorily when installed in accordance with ASTM D 2321, and deflection is measured not less than 30 days following installation.

Manufacturing processes differ for SPIROLITE and PLEXCO pipe. Deflection limitations for PLEXCO pipe are controlled by long term material strain.

Ring Bending Strain

As pipe deflects, bending strains occur in the pipe wall. For an elliptically deformed pipe, the pipe wall ring bending strain, ε, can be related to deflection by:

$$\varepsilon = f_D \frac{\Delta Y}{D_M}\frac{2C}{D_M} \qquad \textbf{(7-37)}$$

Where terms are previously defined, and:

ε = wall strain, %

f_D = deformation shape factor

D_M = mean diameter, in, (Equations (7-25) + (7-26))

C = outer fiber to wall centroid, in

SPIROLITE Pipe:

$$C = h - z \qquad \textbf{(7-38)}$$

PLEXCO Pipe:

$$C = 0.5\,(1.06\,t) \qquad \textbf{(7-39)}$$

h = pipe wall height, in

z = pipe wall centroid, in

t = pipe minimum wall thickness, in

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For elliptical deformation, $f_D = 4.28$. However, buried pipe rarely has a perfectly elliptical shape. Irregular deformation can occur from installation forces such as compaction variation alongside the pipe. To account for the non-elliptical shape many designers use $f_D = 6.0$.

Lytton and Chua report that for high performance polyethylene materials such as those used by PLEXCO, 4.2% ring bending strain is a conservative value for non-pressure pipe. Jansen reports that high performance polyethylene material at an 8% strain level has a life expectancy of a least 50 years.

When designing non-pressure heavy wall (< SDR 17) PLEXCO pipe, and high RSC (several hundred) SPIROLITE pipe, the ring bending strain at the predicted deflection should be calculated and compared to the allowable strain.

In pressure pipe, stress from deflection and internal pressure should not exceed the materials long term design stress rating. See Table 7-9, below.

***Table 7-9* Safe Pressure Pipe Deflection**

DR or SDR	Safe Deflection as % of Diameter
32.5	8.5
26	7.0
21	6.0
17	5.0
13.5	4.0
11	3.0
9	2.5

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Example 7-13

Find the ring bending strain in the wall of the SPIROLITE 36" Class 100 pipe in Example 7-12.

Solution: Use Equation (7-37) and f_D = 6.0. Bulletin No. 910 gives: h = 2.02 in., and z = 0.58 in.

$$\varepsilon = 6\,(0.0237)\,\frac{2.02 - 0.58}{36 + 2\,(0.58)}$$

$$\varepsilon = 0.0055 = 0.55\%$$

The strain is well below the allowable strain of 4.2 percent for profile pipe.

Design Considerations For Shallow Cover Pipe

Pipe installed under shallow cover does not develop a complete soil structure interaction, so design methods must be modified for these installations. The designer should consider the following three cases: (1) flotation due to insufficient soil cover, (2) ring bending due to live load, and (3) upward buckling due to flooding or high groundwater levels.

The exact depth of cover required to develop the full soil structure interaction depends on the particular installation conditions.

Shallow Cover Surcharge Load

The preceding design methods assume that the pipe behaves primarily as a membrane structure, that is, the pipe is almost perfectly flexible with little ability to resist bending.

At depths of cover less than one pipe diameter, this membrane action may not be fully developed. So, an applied surcharge load or live load places a bending

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load on the pipe crown. For this reason, flexible pipe manufacturers often recommend that pipe be buried at least one pipe diameter below a live load. If this cannot be accomplished, the designer should perform a special analysis to determine if the pipe has adequate beam bending strength.

R. Watkins in "Minimum Soil Cover Required Over Buried Flexible Cylinders" gives a design equation for determining pipe cross sections for shallow cover live load applications. Watkins method is based on the premise that the live load at shallow cover is resisted by a combination of the pipes flexural strength, and the ring resistance of the soil surrounding the pipe. The maximum bending stress occurring in the pipe wall can be found by considering the top half of the pipe as a pinned end arch.

For Plexco/Spirolite pipe, Watkins analysis should be used only where the depth of cover is greater than one-half of the pipe diameter and the pipe is installed at least 18 inches deep. For lesser cover depths, a reinforced concrete cap should be considered.

Based on Watkins analysis the live load pressure on the pipe, P_L, should not exceed the upper limit given in Equation (7-40).

$$P_L \le \frac{12\,w\,(KH)^2}{N\,D_0} + \frac{7387.2\,(I)}{N\,D_0^{\,2}\,C}\left(S - \frac{w\,D_0\,H}{288\,A}\right) \qquad \textbf{(7-40)}$$

where

w = unit weight of soil, lb/ft^2

D_0 = pipe outside diameter, in

H = cover height, ft

I = pipe wall moment of inertia, in^4/in

A = pipe wall area in^2/in

C = outer fiber to wall centroid, in (Equations 7-38 and 7-39, page 65)

S = material yield strength, lb/in^2

N = safety factor

K = passive earth pressure coefficient

$$K = \frac{1 + SIN\,(\phi)}{1 - SIN\,(\phi)} \qquad \textbf{(7-41)}$$

ϕ = angle of internal friction, deg

Watkins developed Equation (7-40) using a load applied to a part of the pipe crown, so any surcharge load should be determined using a point load method, rather than a distributed load method.

A design safety factor of at least 2 should be applied.

In addition to the pipe bending check with Watkins formula, the designer should check pipe wall compressive stress, and pipe wall buckling due to the live load stress. When a pipe is installed with shallow cover below an unpaved surface, rutting can occur which will not only reduce cover depth, but also increase the impact factor. State highway authorities commonly set the minimum cover depth under below pavement. This cover depth varies by State, but is usually 2.5 to 5 ft.

Shallow Cover Buckling

The buckling resistance of a buried pipe increases with increasing cover depth, because the surrounding soil is stiffened by the increase in overburden pressure. However, a different buckling mechanism may occur when pipe is located near the surface.

Groundwater or flooding may apply an external pressure on the pipe, and result in upward buckling, that is the sides of the pipe deflect inward (negative horizontal deflection) and the crown deflects upward. This mechanism is possible when cover depth is insufficient to restrain upward crown movement, and when the pipe is empty or partially full.

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Shallow cover may not be sufficient for complete development of soil support. AWWA C-950 suggests that a minimum cover of four feet is required, however, larger diameter pipe may require as much as a diameter and a half to develop full support.

Shallow cover buckling may also occur if the pipe can float slightly upward and lose contact with the embedment material below its springline.

Shallow cover deserves special design attention. A conservative design alternative is to assume no soil support, and design using unconstrained pipe wall buckling methods. A concrete cap, sufficient to resist upward deflection, may also be placed over the pipe.

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Source 1: CPChem, The Performance Pipe Engineering Manual
Book 2, Chapter 5: Thermal Effects
2002

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Table 5-1 **Typical Elastic Modulus, 10^3 psi**
Nominal values based on ASTM D 638 testing of molded material specimens.

Plexco/Spirolite PE 3408								
Duration	*Temperature, °F*							
	-20	*0*	*40*	*60*	*73*	*100*	*120*	*140*
Short Term	300.0	260.0	170.0	130.0	110.0	100.0	65.0	50.0
10 h	140.8	122.0	79.8	61.0	57.5	46.9	30.5	23.5
100 h	125.4	108.7	71.0	54.3	51.2	41.8	27.2	20.9
1000 h	107.0	92.8	60.7	46.4	43.7	35.7	23.2	17.8
1 y	93.0	80.6	52.7	40.3	38.0	31.0	20.2	15.5
10 y	77.4	67.1	43.9	33.5	31.6	25.8	16.8	12.9
50 y	69.1	59.9	39.1	29.9	28.2	23.0	15.0	11.5

→ 23.0×10^3 psi = 23,000 psi
→ Sheets 5 & 7 of All calcs with Attachment H.

- ❑ Lateral deflection expansion loops (snaking the pipe)
- ❑ Anchor and guide the pipe
- ❑ Conventional Expansion loops
- ❑ Expansion joints
- ❑ Burying pipes

Lateral Deflection Expansion Loops

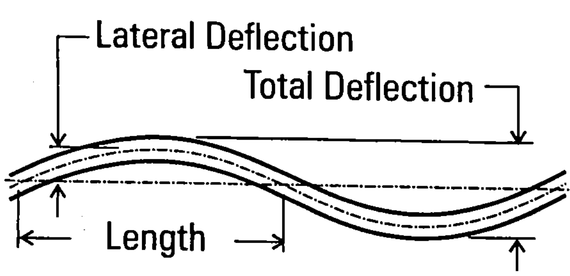
The simplest installation involves stringing pipe between end point anchor structures. If the pipe is simply laid in a straight line between the end anchors then (1) the pipeline anchoring structures must be capable of handling potentially high thermal contraction thrust loads during temperature decrease, and (2) during temperature increase, the maximum compressive thrust is the force required to cause lateral deflection at which time the compressive stress and end thrust would then decrease. To minimize these loads, pipe may be pre-snaked during installation.

Snaked piping installations are also referred to as lateral deflection expansion loops. These loops can be used for PLEXCO piping systems which are laid on the surface, supported or suspended above grade on hangers or in racks, or installed underwater, but not buried.

An effective flexible pipe expansion loop system employs the pipe's natural tendency to deflect laterally, and its high strain tolerance. Lateral deflection expansion loops are recurrent "S-curves" (snaking) along the piping runs that provide an initial lateral deflection, and allow pipe temperature changes to result in greater or lesser lateral deflection.

Surface and rack supported pipe systems designed with lateral deflection expansion loops must provide sufficient width allowance for lateral pipe deflection. The

Figure 5-1 **Lateral Deflection**



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DRISCOPIPE

Dimensions and Pressure Ratings
1 0 0 0 Series Pipe

PHILLIPS 66

Size	SDR	PSI @73.4	Weight lbs.	Dimensions - Inches Nominal O D	Approx. I D	Min. Wall
2"	11	160	.62	2.375	1.865	.216
	13.5	128	.52		2.023	.176
	15.5	110	.46		2.069	.153
	17	100	.42		2.095	.140
3"	7	267	2.00	3.500	2.500	.500
	9	200	1.62		2.722	.389
	11	160	1.35		2.864	.318
	13.5	128	1.12		2.982	.259
	15.5	110	.99		3.048	.226
	17	100	.91		3.088	.206
	19	89	.82		3.132	.184
	21	80	.74		3.166	.167
	26	64	.61		3.230	.135
	32.5	51	.49		3.284	.108
4"	7	267	3.31	4.500	3.214	.643
	9	200	2.67		3.500	.500
	11	160	2.23		3.682	.409
	13.5	128	1.85		3.834	.333
	15.5	110	1.63		3.920	.290
	17	100	1.50		3.970	.265
	19	89	1.35		4.026	.237
	21	80	1.23		4.072	.214
	26	64	1.00		4.154	.173
	32.5	51	.81		4.224	.138
5-3/8"	21	80	1.75	5.375	4.863	.256
	26	64	1.43		4.961	.207
	32.5	51	1.15		5.045	.165
5"	7	267	5.05	5.563	3.973	.795
	9	200	4.08		4.327	.618
	11	160	3.42		4.551	.506
	13.5	128	2.84		4.739	.412
	15.5	110	2.50		4.845	.359
	17	100	2.29		4.909	.327
	19	89	2.07		4.977	.293
	21	80	1.88		5.033	.265
	26	64	1.53		5.135	.214
	32.5	51	1.23		5.221	.171
6"	7	267	7.16	6.625	4.733	.946
	9	200	5.78		5.153	.736
	11	160	4.84		5.421	.602
	13.5	128	4.03		5.643	.491
	15.5	110	3.54		5.771	.427
	17	100	3.25		5.845	.390
	19	89	2.93		5.927	.349
	21	80	2.66		5.995	.315
	26	64	2.17		6.115	.255
	32.5	51	1.75		6.217	.204
7"	7	267	8.29	7.125	5.089	1.018
	9	200	6.69		5.541	.792
	11	160	5.61		5.829	.648
	13.5	128	4.66		6.069	.528
	15.5	110	4.10		6.205	.460
	17	100	3.76		6.287	.419
	19	89	3.39		6.375	.375
	21	80	3.08		6.445	.340
	26	64	2.51		6.577	.274
	32.5	51	2.02		6.685	.220
8"	7	267	12.14	8.625	6.161	1.232
	9	200	9.80		6.709	.958
	11	160	8.21		7.057	.784
	13.5	128	6.82		7.347	.639
	15.5	110	6.00		7.513	.556
	17	100	5.50		7.611	.507
	19	89	4.96		7.717	.454
	21	80	4.52		7.803	.411
	26	64	3.68		7.961	.332
	32.5	51	2.97		8.095	.265
10"	7	267	18.86	10.750	7.678	1.536
	9	200	15.23		8.362	1.194
	11	160	12.75		8.796	.977
	13.5	128	10.59		9.158	.796
	15.5	110	9.33		9.362	.694
	17	100	8.55		9.486	.632
	19	89	7.71		9.618	.566
	21	80	7.01		9.726	.512
	26	64	5.71		9.924	.413
	32.5	51	4.62		10.088	.331
12"	7	267	26.53	12.750	9.108	1.821
	9	200	21.44		9.916	1.417
	11	160	17.94		10.432	1.159
	13.5	128	14.89		10.862	.944
	15.5	110	13.12		11.104	.823
	17	100	12.03		11.250	.750
	19	89	10.84		11.408	.671
	21	80	9.86		11.536	.607
	26	64	8.04		11.770	.490
	32.5	51	6.48		11.966	.392
13"	7	267	29.24	13.386	9.562	1.912
	9	200	23.62		10.412	1.487
	11	160	19.78		10.952	1.217
	13.5	128	16.43		11.402	.992
	15.5	110	14.46		11.658	.864
	17	100	13.26		11.812	.787
	19	89	11.96		11.976	.705
	21	80	10.86		12.112	.637
	26	64	8.87		12.356	.515
	32.5	51	7.15		12.562	.412
14"	7	267	31.99	14.000	10.000	2.000
	9	200	25.84		10.888	1.556
	11	160	21.64		11.454	1.273
	13.5	128	17.97		11.926	1.037
	15.5	110	15.81		12.194	.903
	17	100	14.52		12.352	.824
	19	89	13.07		12.526	.737
	21	80	11.90		12.666	.667
	26	64	9.69		12.924	.538
	32.5	51	7.83		13.138	.431
16"	9	200	33.75	16.000	12.444	1.778
	11	160	28.27		13.090	1.455
	13.5	128	23.46		13.630	1.185
	15.5	110	20.65		13.936	1.032
	17	100	18.95		14.118	.941
	19	89	17.07		14.316	.842
	21	80	15.53		14.476	.762
	26	64	12.66		14.770	.615
	32.5	51	10.21		15.016	.492

Values used in calculation

XX

Dimensions and Pressure Ratings for 1 0 0 0 series Pipe

Size	SDR	PSI @73.4	Weight lbs.	Dimensions - inches Nominal O D	Approx. I D	Min. Wall
	11	160	35.76	18.000	14.728	1.636
	13.5	128	29.69		15.334	1.333
	15.5	110	26.14		15.678	1.161
18"	17	100	23.99		15.882	1.059
	19	89	21.60		16.106	0.947
	21	80	19.65		16.286	0.857
	26	64	16.03		16.616	0.692
	32.5	51	12.94		16.892	0.554
	11	160	44.15	20.000	16.364	1.818
	13.5	128	36.66		17.038	1.481
	15.5	110	32.27		17.420	1.290
20"	17	100	29.60		17.648	1.176
	19	89	26.68		17.894	1.053
	21	80	24.26		18.096	0.952
	26	64	19.79		18.462	0.769
	32.5	51	15.96		18.770	0.615
	11	160	51.04	21.500	17.590	1.955
	13.5	128	42.38		18.314	1.593
	15.5	110	37.30		18.726	1.387
21.5	17	100	34.23		18.970	1.265
	19	89	30.84		19.236	1.132
	21	80	28.05		19.452	1.024
	26	64	22.88		19.846	0.827
	32.5	51	18.46		20.176	0.662
	11	160	53.43	22.000	18.000	2.000
	13.5	128	44.38		18.740	1.630
	15.5	110	39.04		19.162	1.419
22"	17	100	35.83		19.412	1.294
	19	89	32.28		19.684	1.158
	21	80	29.37		19.904	1.048
	26	64	23.95		20.308	0.846
	32.5	51	19.32		20.646	0.677
	11	160	63.59	24.000	19.636	2.182
	13.5	128	52.81		20.444	1.778
	15.5	110	46.47		20.904	1.548
24"	17	100	42.65		21.176	1.412
	19	89	38.41		21.474	1.263
	21	80	34.95		21.714	1.143
	26	64	28.50		22.154	0.923
	32.5	51	22.98		22.524	0.738
	11	160	74.63	26.000	21.272	2.364
	13.5	128	61.97		22.148	1.926
	15.5	110	54.55		22.646	1.677
26"	17	100	50.03		22.942	1.529
	19	89	45.07		23.264	1.368
	21	80	41.01		23.524	1.238
	26	64	33.45		24.000	1.000
	32.5	51	26.98		24.400	0.800
	11	160	86.55	28.000	22.910	2.545
	13.5	128	71.86		23.852	2.074
	15.5	110	63.26		24.388	1.806
28"	17	100	58.04		24.706	1.647
	19	89	52.29		25.052	1.474
	21	80	47.55		25.334	1.333
	26	64	38.80		25.846	1.077
	32.5	51	31.31		26.276	0.862
	11	160	99.34	30.000	24.546	2.727
	13.5	128	82.50		25.556	2.222
	15.5	110	72.62		26.130	1.935
30"	17	100	66.64		26.470	1.765
	19	89	60.02		26.842	1.579
	21	80	54.61		27.142	1.429
	26	64	44.54		27.692	1.154
	32.5	51	35.92		28.154	0.923
	13.5	128	90.93	31.496	26.830	2.333
	15.5	110	80.04		27.432	2.032
800	17	100	73.45		27.790	1.853
mm	19	89	66.17		28.180	1.658
	21	80	60.19		28.496	1.500
	26	64	49.07		29.074	1.211
	32.5	51	39.59		29.558	0.969
	13.5	128	93.85	32.000	27.260	2.370
	15.5	110	82.64		27.870	2.065
	17	100	75.79		28.236	1.882
32"	19	89	68.28		28.632	1.684
	21	80	62.13		28.952	1.524
	26	64	50.68		29.538	1.231
	32.5	51	40.89		30.030	0.985
	13.5	128	105.98	34.000	28.962	2.519
	15.5	110	93.29		29.612	2.194
	17	100	85.58		30.000	2.000
34"	19	89	77.07		30.422	1.789
	21	80	70.13		30.762	1.619
	26	64	57.22		31.384	1.308
	32.5	51	46.14		31.908	1.046
	13.5	128	118.81	36.000	30.666	2.667
	15.5	110	104.57		31.354	2.323
	17	100	95.96		31.764	2.118
36"	19	89	86.44		32.210	1.895
	21	80	78.61		32.572	1.714
	26	64	64.15		33.230	1.385
	32.5	51	51.74		33.784	1.108
	17	100	114.75	39.370	34.738	2.316
1000	19	89	103.36		35.226	2.072
mm	21	80	94.04		35.620	1.875
	26	64	76.69		36.342	1.514
	32.5	51	61.85		36.948	1.211
	17	100	130.61	42.000	37.058	2.471
	19	89	117.66		37.578	2.211
42"	21	80	107.01		38.000	2.000
	26	64	87.27		38.770	1.615
	32.5	51	70.39		39.416	1.292
	17	100	165.23	47.244	41.686	2.779
1200	19	89	148.87		42.270	2.487
mm	21	80	135.42		42.744	2.250
	26	64	110.45		43.610	1.817
	32.5	51	89.11		44.336	1.454
54"	26	64	144.30	54.000	49.846	2.077
	32.5	51	116.42		50.676	1.662

Approximate ID = Nominal OD - (2 times Min.Wall)

SDR (Standard Dimension Ratio) = $\frac{\text{OD}}{\text{min. wall}}$

Pressure rating = $\frac{2\,s}{\text{SDR}-1}$ @ 73.4 deg. F

s = hydrostatic design stress (800 psi)

Attachment 4
1/4

EQUIPMENT

Find a **Dealer** on the web or th dealer to you.

Track-Type Tractors

Choose a Different Product Family

D6R II XW

Other Models: D6R II XW

Back to Track-Type Tractors

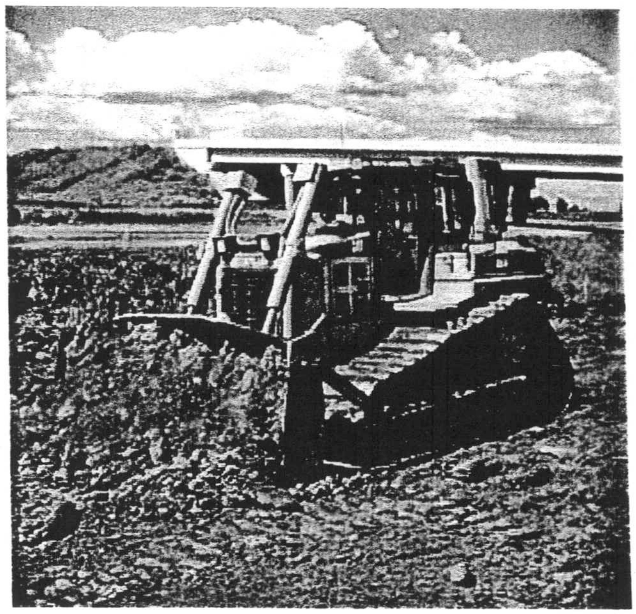
SEARCH CAT.CO

GO

Printer Friendly

The D6R Series II XW arrangement is best suited for steep slope applications or where customers need additional flotation and the ability to work in a mixture of soft to moderate dozing conditions.

Features & Benefits



Related Industries: Construction, Heavy Construction

RELATED LINKS

- Incident Repo
- Get A Quote
- "Build & Quot
- Screensavers/
- Lexion® Com
- MT Series Ag

Detailed Specifications

Engine

Engine Model	Cat C-9
Flywheel Power	138 kW / 185 hp
Net Power - Caterpillar	138 kW / 185 hp
Net Power - ISO 9249	138 kW / 185 hp
Net Power - SAE J1349	136 kW / 183 hp
Net Power - EU 80/1269	138 kW / 185 hp

Attachment 4
2/4

Detailed Specifications

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION

MAY 23 2005

SOUTHWEST DISTRICT
TAMPA

Engine	
Engine Model	Cat C-9
Flywheel Power	138 kW / 185 hp
Net Power - Caterpillar	138 kW / 185 hp
Net Power - ISO 9249	138 kW / 185 hp
Net Power - SAE J1349	136 kW / 183 hp
Net Power - EU 80/1269	138 kW / 185 hp
Net Power - DIN 70020	192 PS
Bore	112 mm / 4.4 in
Stroke	149 mm / 5.9 in
Displacement	8.8 L / 537 in3
Transmission	
1 Forward	3.8 kph / 2.4 mph
2 Forward	6.6 kph / 4.1 mph
3 Forward	11.5 kph / 7.1 mph
1 Reverse	4.8 kph / 3 mph
2 Reverse	8.4 kph / 5.2 mph
3 Reverse	14.6 kph / 9.1 mph
Undercarriage - Std.	
Track Rollers/side	7
Width of Shoe	762 mm / 30 in → track width
Track on Ground	2822 mm / 9.2 ft = 110 inch → track length
Track Gauge	2032 mm / 80 in → track gauge
Ground Pressure (Std.)	47.82 kPa / 6.94 psi
Ground Clearance	383 mm / 14.8 in
Ground Contact Area w/Shoe	4.33 m2 / 6661 in2
Service Refill Capacities	
Cooling System	76.8 L / 20.3 gal
Engine Crankcase	28 L / 7.4 gal
Power Train	145.7 L / 38.5 gal
Final Drives (each)	13.6 L / 3.6 gal
Roller Frames (each)	24.6 L / 6.5 gal
Hydraulic Tank	47.3 L / 12.5 gal

Sheet 1 of construct calcs in this attachment

Attachment 4
3/4

Pivot Shaft Compartment	1.9 L / 0.5 gal
Hydraulic Controls - Maximum Operating Pressure	
Bulldozer	19300 kPa / 2799 psi
Bulldozer Tilt	19300 kPa / 2799 psi
Tilt Cylinder	19300 kPa / 2799 psi
Ripper (Lift)	19300 kPa / 2799 psi
Ripper (Pitch)	19300 kPa / 2799 psi
Steering	38000 kPa / 5511 psi
Hydraulic Controls - Pump	
Pump Capacity at	6900 kPa / 1001 psi
RPM at Rated Engine Speed	2125 RPM / 2125 RPM
Pump Output (Clutch Brake)	212 L/min / 56 gal/min
Pump Output (Differential Steering)	217 L/min / 57.3 gal/min
Lift Cylinder Flow	190 L/min / 50.2 gal/min
Tilt Cylinder Flow	80 L/min / 21.1 gal/min
Ripper Cylinder Flow	160 L/min / 42.3 gal/min
Hydraulic Controls - Main Relief Valve Settings	
Clutch Brake Models	19300 kPa / 2799 psi
Differential Steering Models	42000 kPa / 6092 psi
Winch Specifications	
Winch Model	PA 56
Weight	1179 kg / 2600 lb
Winch and Bracket Length	1210 mm / 47.6 in
Winch Case Length	1210 mm / 47.6 in
Winch Case Width	975 mm / 38.4 in
Flange Diameter	504 mm / 19.8 in
Drum Width	330 mm / 13 in
Drum Diameter	254 mm / 10 in
Drum Capacity - 22 mm (.88 in)	88 m / 290 ft
Drum Capacity - 25 mm (1.0 in)	67 m / 220 ft
Drum Capacity - 29 mm (1.13 in)	67 m / 220 ft
Ferrule Size (O.D. X Length)	54 x 67 mm (2.10 x 2.63 in)
Oil Capacity	67 L / 17.7 gal
Dimensions	
Height	2380 mm / 7.8 ft
Height ROPS/Canopy	3190 mm / 10.4 ft

Attachment 4
4/4

Length w/Blade	5.71 m / 18.75 ft
Overall Length w/o Blade	4.08 m / 13.3 ft
Blades	
Blade Type	SU, A, PAT
XW SU Blade Capacity	5.62 m3 / 7.35 yd3
XW SU Blade Width	3556 mm / 11.7 ft
XW A Blade Capacity	4.3 m3 / 5.62 yd3
XW A Blade Width	4200 mm / 13.78 ft
XW PAT Blade Capacity	5.08 m3 / 6.65 yd3
XW PAT Blade Width	3794 mm / 12.45 ft
Multi-Shank Ripper	
Type	Fixed Parallelogram
Beam width	2202 mm / 87 in
Beam cross section	216 x 254 mm (8.5 x 10.0 in)
Maximum penetration	500 mm / 19.7 in
Maximum clearance raised (shank tip)	511 mm / 20.1 in
Number of pockets	3
Maximum penetration force	6603 kg / 14557 lb
Maximum pryout force	9134 kg / 20137 lb
Weight - with one shank	1634 kg / 3603 lb
Weight - each additional shank	74 kg / 163 lb
Weights	
Operating Weight Power PSDS	19960 kg / $\boxed{\text{44000 lb}}$ Equipment Weight; Sheet 1 of construction calcs in this attachment
Operating Weight - XW	19904 kg / 43888 lb
Shipping Weight - XW	16043 kg / 35374 lb
Fuel Tank	
Fuel Tank Capacity	383 L / 101 gal

Attachment 5
1/4

EQUIPMENT

Find a **Dealer** on the web or t dealer to you.

Track-Type Tractors

Choose a Different Product Family

D7R Series II

Other Models: D7R Series II

Back to Track-Type Tractors

SEARCH CAT.CO

GO

Printer Friendly

Engineered for demanding work. The D7R Series II is designed to be productive in a variety of applications. It keeps material moving with the reliability and low operating costs you expect from Cat machines.

Features & Benefits

Standard Equipment

Optional Equipment

Specification Graphics (PDF: 167K)

Related Industries: Agriculture, Construction, Forestry, Heavy Construction, Industrial, Quarry/Aggregate, Waste

RELATED LINKS

- Incident Repo
- Get A Quote
- "Build & Quot
- Screensavers/
- Lexion® Com
- MT Series Ag

Attachment 5
2/4

Detailed Specifications

Engine	
Engine Model	Cat 3176C
Flywheel Power	179 kW / 240 hp
Maximum Flywheel Power	192 kW / 258 hp
Net Power - Caterpillar	179 kW / 240 hp
Net Power - ISO 9249	179 kW / 240 hp
Net Power - SAE J1349	177 kW / 238 hp
Net Power - EU 80/1269	179 kW / 240 hp
Net Power - DIN 70020	248 PS
Bore	125 mm / 4.9 in
Stroke	140 mm / 5.5 in
Displacement	10.3 L / 629 in3
Weights	
Operating Weight - Std.	24758 kg / 54582 lb → Equipment Weight
Shipping Weight - Std.	20084 kg / 44278 lb
Operating Weight - XR	25334 kg / 55852 lb
Shipping Weight - XR	20660 kg / 45548 lb
Operating Weight - LGP	26897 kg / 59299 lb
Shipping Weight - LGP	22176 kg / 48890 lb
Transmission	
1 Forward	3.52 kph / 2.19 mph
2 Forward	6.1 kph / 3.79 mph
3 Forward	10.54 kph / 6.55 mph
1 Reverse	4.54 kph / 2.82 mph
2 Reverse	7.85 kph / 4.88 mph
3 Reverse	13.58 kph / 8.44 mph
Undercarriage - Std.	
Shoe Type	Extreme Service
Pitch	216 mm / 8.5 in
Number Shoes/Side	40
Grouser Height	71.5 mm / 3 in
Track Rollers/side	7
Width of Shoe	600 mm / 22 in → track width
Track on Ground	2870 mm / 9.4 ft = 113 inch → track length

Sheet 1 of Operations calcs in this Attachment

Sheet 1 of Operations calcs in this attachment

Attachment 5
3/4

Track Gauge	1981 mm / 78 in
Ground Contact Area	3.21 m2 / 4972 in2
Ground Pressure (Std.)	7.58 kPa / 11 psi
Ground Clearance	414 mm / 16.3 in

track gauge

Sheet 1 of Operations calcs in this attachment

Service Refill Capacities

Fuel Tank	479 L / 126.5 gal
Cooling System	77.4 L / 20.4 gal
Engine Crankcase	31 L / 8.2 gal
Power Train	178 L / 47 gal
Final Drives (each)	13 L / 3.4 gal
Roller Frames (each)	24.6 L / 6.5 gal
Attachment Hydraulic System Tank Only	54 L / 14.3 gal
Pivot Shaft Compartment	1.9 L / 0.5 gal

Hydraulic Controls - Maximum Operating Pressure

Bulldozer	22800 kPa / 3307 psi
Tilt Cylinder	17225 kPa / 2498 psi
Ripper (Lift)	22750 kPa / 3300 psi
Ripper (Pitch)	22750 kPa / 3300 psi
Steering	38000 kPa / 5511 psi

Hydraulic Controls - Pump

Pump Capacity at	7000 kPa / 1015 psi
RPM at Rated Engine Speed	2231 RPM / 2231 RPM
Pump Output (Clutch Brake)	222 L/min / 58.6 gal/min
Pump Output (Differential Steering)	295 L/min / 77.9 gal/min
Lift Cylinder Flow	180 L/min / 47.6 gal/min
Tilt Cylinder Flow	80 L/min / 21.1 gal/min
Ripper Cylinder Flow	180 L/min / 47.6 gal/min

Hydraulic Controls - Main Relief Valve Settings

Clutch Brake Models	27000 kPa / 3916 psi
Differential Steering Models	42000 kPa / 6092 psi

Winch Specifications

Winch Model	PA110VS Variable Speed
Weight	1894 kg / 4176 lb
Winch and Bracket Length	1461 mm / 57.5 in
Winch Case Width	1171 mm / 46.1 in
Increased Tractor Length - STD	742 mm / 29.2 in
Increased Tractor Length - XR	587 mm / 23.1 in

Attachment 5
4/4

Increased Tractor Length - LGP	742 mm / 29.2 in
Flange Diameter	610 mm / 24 in
Drum Width	337 mm / 13.3 in
Drum Diameter	318 mm / 12.5 in
Drum Capacity - 24 mm (1 in)	885 m / 418 ft
Drum Capacity - 29 mm (1.13 in)	584 m / 276 ft
Drum Capacity - 32 mm (1.25 in)	409 m / 193 ft
Ferrule Size (O.D. X Length)	2.38 in x 2.56 in / 60 mm x 65 mm
Oil Capacity	15.1 L / 4 gal

Blades

U Blade Capacity	8.34 m3 / 10.91 yd3
U Blade Width	3988 mm / 13.08 ft
SU Blade Capacity	6.86 m3 / 8.98 yd3
SU Blade Width	3693 mm / 12.12 ft
S Blade Capacity	5.16 m3 / 6.75 yd3
S Blade Width	3904 mm / 12.81 ft
LGP S Blade Capacity	5.89 m3 / 7.7 yd3
LGP S Blade Width	4545 mm / 14.91 ft
A Blade Capacity	3.89 m3 / 5.08 yd3
A Blade Width	4503 mm / 14.77 ft

Multi-Shank Ripper

Type	Adjustable Parallelogram
Beam width	2210 mm / 87 in
Beam cross section	343 x 279 mm 13.5 x 11 in
Maximum penetration	748 mm / 29.4 in
Maximum clearance raised (shank tip)	757 mm / 29.8 in
Number of pockets	3
Maximum penetration force	8664 kg / 19100 lb
Maximum pryout force	17138 kg / 38513 lb
Weight - with one shank	3307 kg / 7431 lb
Weight - each additional shank	150 kg / 330 lb

ATTACHMENT H-8

GEOTEXTILE CALCULATIONS

File No. 09199033.09

SUBJECT: Geotextile Calculations, Hardee County Landfill Expansion
Hardee County, Florida

Table of Contents

Soil Boring Logs for
TH-1, TH-5, TH-6, TH-7
can be found in
Attachment J.

TH-1 → TH-7
Conducted by PSI
in 2003

Soil Boring TH-1

IH-1
1/4

SCS ENGINEERS			
		SHEET 1 of 3	
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT LCRS Geotextile Calculations Soil Boring: TH-1, 4 feet Below Surface		BY LEK	DATE 11/25/2003
		CHECKED JHD	DATE

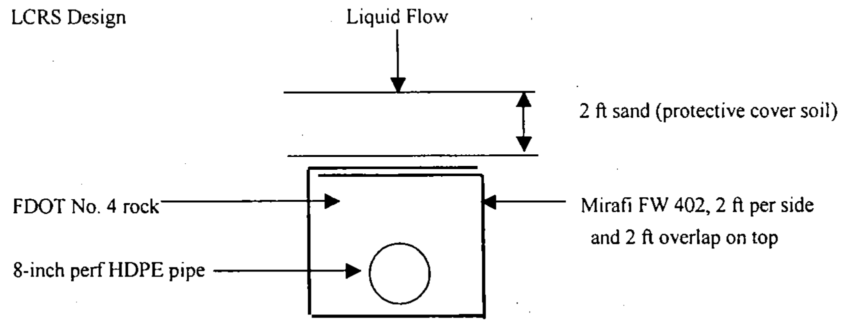
TASKS

1 Using Mirafi FW 402 Woven geotextile, determine if the geotextile will retain in situ sand.

2 Determine if Mirafi FW 402 has sufficient drainage characteristics to allow liquid to pass through.

KNOWN

LCRS Design



TASK 1 - GEOTEXTILE RETAINAGE

ASSUMED

Particle Size Distribution: PSI Geotechnical Engineering Services Report for Hardee County, 9/25/03.

REFERENCES, TASK 1

* Mirafi Chart 4-1 "Soil Retention Criteria" for steady-state flow conditions. Received from Mirafi SE Sales. (Attachment 1)
* Principles of Geotechnical Engineering, 3rd ed., Braja M. Das, p. 23, "Effective Size, Uniformity Coefficient and Coefficient of Gradation" (Attachment 2).
* Mirafi Technical Data (Attachment 3).

SOLUTION, TASK 1

Sheet 4.

1. From the Particle Size Distribution curve, find d_{10} $d_{10} = \boxed{0.075}$ mm

2. Follow Mirafi's chart and perform calculations for decision-making along the flowchart path applicable to the given situation.

a. Since d_{10} = 0.075 mm and d_{10} < 4.8 mm, soil is less than 10% fines and less than 90% gravel.

b. The application is retention. Is the soil stable or unstable?

Calculate C_c

$$C_c = \frac{(d_{30})^2}{(d_{60})(d_{10})}$$

$d_{30} = \boxed{0.101}$ mm
$d_{60} = \boxed{0.199}$ mm

C_c = 0.68

TH-1
2/4

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
LCRS Geotextile Calculations Soil Boring: TH-1, 4 feet Below Surface	LEK	11/25/2003
	CHECKED JHO	DATE

c. Stable Soil $1 <= C_c <= 3$ — Unstable Soil $C_c > 3$ or $C_c < 1$

Soil is an unstable soil

$$C'u = \frac{d_{30}}{d_{10}}$$ to determine soil gradation.

C'u = 1.35

d. Widely Graded C'u >3 — Uniformly Graded C'u < 3

Soil is uniformly graded

e. Using AOS of the chosen geotextile and d'_{50} of the soil, determine if the geotextile will work in varying densities of soil.

Apparent Opening Size, AOS= 0.425 mm

Calculate d'_{50}:

To find d'_{50}, draw a straight line through the extremities of the particle size distribution. Then d'_{50} is the midpoint of this line.

d'_{50} = 1.350 mm

Soil Densities					
Loose		**Medium**		**Dense**	
AOS < (C'u)(d'$_{50}$)		AOS < 1.5(C'u)(d'$_{50}$)		AOS < 2(C'u)(d'$_{50}$)	
AOS	(C'u)(d'$_{50}$)	AOS	1.5(C'u)(d'$_{50}$)	AOS	2(C'u)(d'$_{50}$)
0.425	1.818	0.425	2.727	0.425	3.636
OK		OK		OK	

3. CONCLUSION, TASK 1 - RETAINAGE

Mirafi FW 402 geotextile is applicable for the retainage of the given soil when the relative density loose, medium, or dense. ok

Note: Density is Relative Density, I_d

Loose Density	Medium Density	Dense
$I_d < 35\%$	$35\% < I_d < 65\%$	$I_d > 65\%$

TH-1
3/4

SCS ENGINEERS

SHEET 3 of 3

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
LCRS Geotextile Calculations Soil Boring: TH-1, 4 feet Below Surface	LEK	11/25/2003
	CHECKED JHb	DATE

Task 2 - FLOW THROUGH THE GEOTEXTILE

REFERENCES, TASK 2

* Designing with Geosynthetics, 3rd ed., Robert M. Koerner, Chapter 2
* HELP Model Output for Hardee County Landfill Expansion (Attachment 5)

SOLUTION, TASK 2

Mirafi FW 402 Permittivity, Ψ_{ult} = 2.14 sec^{-1}

Following Koerner's example, check flow capability.

1. Estimate maximum flow coming to the geotextile, q, in ft^3 / sec..

Maximum flow occurs when the cell is open, prior to waste filling. The open cell will have 2 acres open.

HELP Model: Open Cell run → Attachment H-6

Peak daily flow = 10,078 cf/day = 0.117 cfs

2. From Koerner, calculate $\Psi_{req'd}$, required permittivity

$$\Psi_{req'd} = \frac{q}{(\Delta_h)(A)}$$ (Equation 2.16, Koerner)

q = flow coming to the geotextile
Δ_h = head loss = 2 ft (the depth of sand)
A = Area of geotextile through which flow will pass = 8.2 sf (per ft in the z direction)

$$\Psi_{req'd} = \frac{q}{(\Delta_h)(A)} = 0.01 \ sec^{-1}$$

3. Check: $\Psi_{req'd}$ vs allowable permittivity, Ψ_{ult}, of the chosen geotextile

$$\Psi_{allow} = \frac{\Psi_{ult}}{FS_{SC} \times FS_{CR} \times FS_{IN} \times FS_{CC} \times FS_{BC}} \quad 1.19$$ (Koerner, Equation 2.25)

FS_{SC} = factor of safety for soil clogging	=	1	Soil clogging does not apply.
FS_{CR}= factor of safety for creep reduction	=	1	Creep does not apply.
FS_{IN}= factor of safety for intrusion	=	1	Intrusion does not apply.
FS_{CC}= factor of safety for chemical clogging	=	1.5	Table 2.12, Koerner (Attachment 4)
FS_{BC}= factor of safety for biological clogging	=	1.2	Table 2.12, Koerner (Attachment 4)

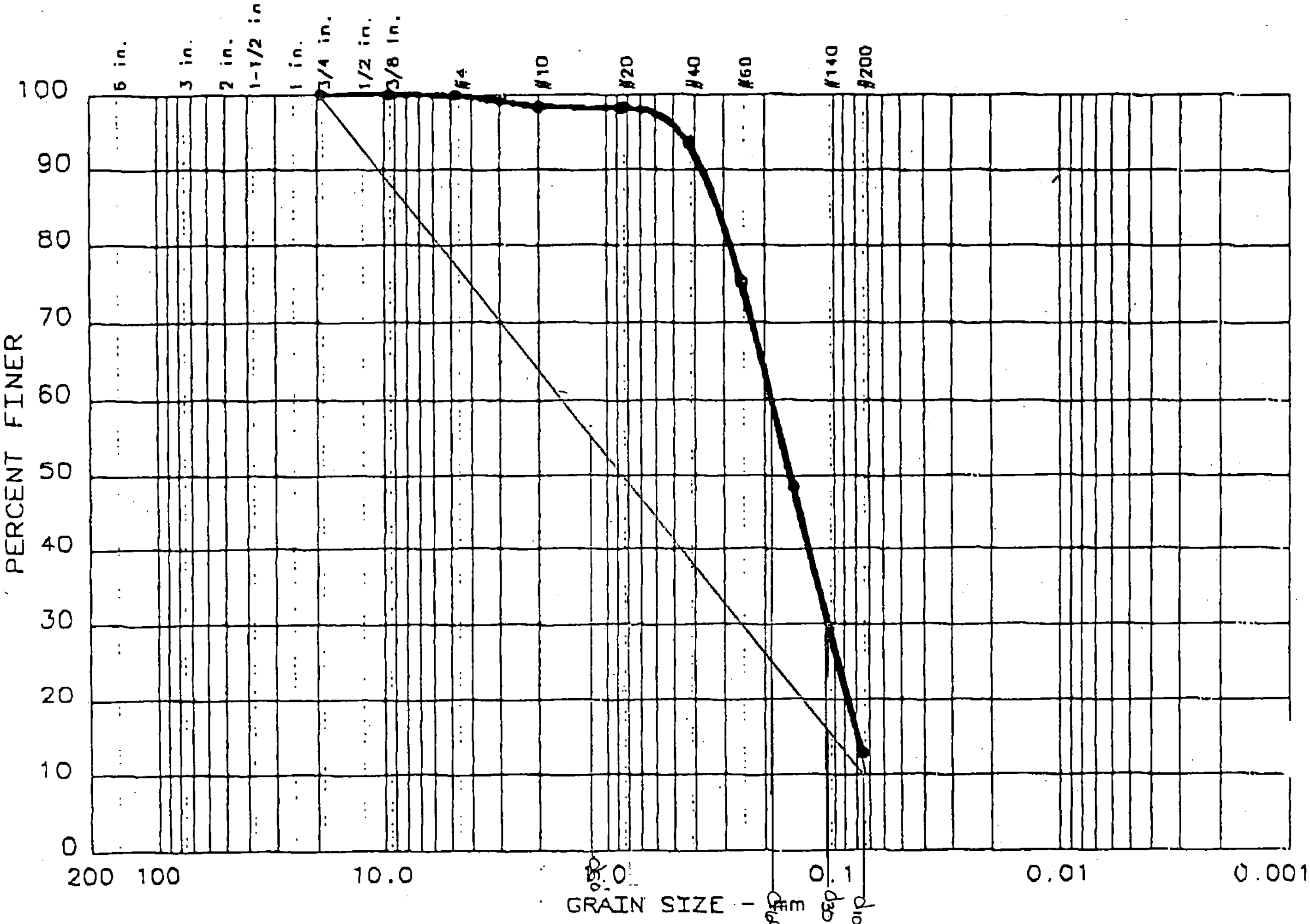
$$\text{F.S., Factor of Safety} = \frac{\Psi_{allow}}{\Psi_{req'd}} = \frac{1.189}{0.007}$$ (Koerner, Equation 2.2a)

F.S. = 167

4. CONCLUSION, TASK 2 - DRAINAGE

Mirafi FW 402 woven geotextile has sufficient drainage characteristics to handle the peak conditions of leachate flow.

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	2	0.0	1.7	85.3	13.0	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.316	0.186	0.154	0.105	0.0781			

MATERIAL DESCRIPTION	USCS	AASHTO
● LIGHT BROWN SLIGHTLY SILTY FINE SAND	SM	A-2-4(0.2)

Project No.: 761
Project: HARDEE COUNTY LANDFILL
● Location: DELIVERED BT TAMPA LAB
TH 1 4' below Surface
Date: 5-19-2003

Remarks:
d_{10} = 0.075 MM
d_{30} = 0.101 MM
d_{60} = 0.199 MM
d_{60}' = 1.350 MM

GRAIN SIZE DISTRIBUTION TEST REPORT

Soil Boring TH-5

TH-5
1/4

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
LCRS Geotextile Calculations Soil Boring: TH-5, 15 feet Below Surface		LEK	11/25/2003
		CHECKED	DATE
		JHD	

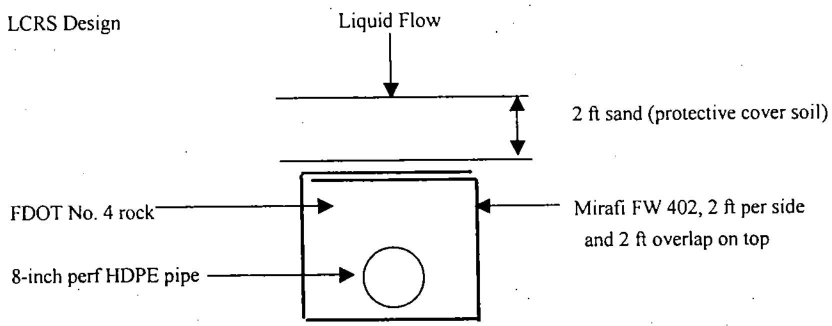
TASKS

1 Using Mirafi FW 402 Woven geotextile, determine if the geotextile will retain in situ sand.

2 Determine if Mirafi FW 402 has sufficient drainage characteristics to allow liquid to pass through.

KNOWN

LCRS Design



TASK 1 - GEOTEXTILE RETAINAGE

ASSUMED

Particle Size Distribution: PSI Geotechnical Engineering Services Report for Hardee County, 9/25/03.

REFERENCES, TASK 1

* Mirafi Chart 4-1 "Soil Retention Criteria" for steady-state flow conditions. Received from Mirafi SE Sales. (Attachment 1)
* Principles of Geotechnical Engineering, 3rd ed., Braja M. Das, p. 23, "Effective Size, Uniformity Coefficient and Coefficient of Gradation" (Attachment 2).
* Mirafi Technical Data (Attachment 3).

SOLUTION, TASK 1

Sheet 4

1. From the Particle Size Distribution curve, find d_{10} $d_{10} = \boxed{0.064}$ mm

2. Follow Mirafi's chart and perform calculations for decision-making along the flowchart path applicable to the given situation.

a. Since $d_{10} > 0.075$ mm and $d_{10} < 4.8$ mm, soil is less than 10% fines and less than 90% gravel.

b. The application is retention. Is the soil stable or unstable?

Calculate C_c $C_c = \dfrac{(d_{30})^2}{(d_{60})(d_{10})}$ $d_{30} = \boxed{0.200}$ mm, $d_{60} = \boxed{0.550}$ mm

$C_c = 1.14$

TH-5
2/4

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
LCRS Geotextile Calculations Soil Boring: TH-5, 15 feet Below Surface		LEK	11/25/2003
		CHECKED	DATE
		JHO	

c. Stable Soil $1 <= C_c <= 3$ — Unstable Soil $C_c > 3$ or $C_c < 1$

Soil is an unstable soil

Since $C_c = 0.93$, soil is stable, use $C'u = \frac{d_{30}}{d_{10}}$ to determine soil gradation.

C'u = 3.13

d. Widely Graded C'u >3 — Uniformly Graded C'u < 3

Soil is widely graded

e. Using AOS of the chosen geotextile and d'_{50} of the soil, determine if the geotextile will work in varying densities of soil.

Apparent Opening Size, AOS= 0.425 mm

Calculate d'_{50}:
To find d'_{50}, draw a straight line through the extremities of the particle size distribution. Then d'_{50} is the midpoint of this line.

d'_{50} = 0.840 mm

Soil Densities					
Loose		Medium		Dense	
AOS < $(9*d'_{50})/(C'u)$		AOS < $(13.5*d'_{50})/(C'u)$		AOS < $(18*d'_{50})/(C'u)$	
AOS	$(9d'_{50})/(C'u)$	AOS	$(13.5d'_{50})/(C'u)$	AOS	$(18d'_{50})/(C'u)$
0.425	2.419	0.425	3.629	0.425	4.838
OK		OK		OK	

3. CONCLUSION, TASK 1 - RETAINAGE
Mirafi FW 402 geotextile is applicable for the retainage of the given soil when the relative density loose, medium, or dense. ok

Note: Density is Relative Density, I_d

Loose Density	Medium Density	Dense
$I_d < 35\%$	$35\% < I_d < 65\%$	$I_d > 65\%$

TH - 5
3/4

Task 2 - FLOW THROUGH THE GEOTEXTILE

REFERENCES, TASK 2

* Designing with Geosynthetics, 3rd ed., Robert M. Koerner, Chapter 2
* HELP Model Output for Hardee County Landfill Expansion (Attachment 5)

SOLUTION, TASK 2

Mirafi FW 402 Permittivity, Ψ_{ult} = 2.14 sec^{-1}

Following Koerner's example, check flow capability.

1. Estimate maximum flow coming to the geotextile, q; in ft^3 / sec..

Maximum flow occurs when the cell is open, prior to waste filling. The open cell will have 2 acres open.

HELP Model: Open Cell run ⟶ Attachment H-6

Peak daily flow = 10,078 cf/day = 0.117 cfs

2. From Koerner, calculate $\Psi_{req'd}$, required permittivity

$$\Psi_{req'd} = \frac{q}{(\Delta_h)(A)}$$ (Equation 2.16, Koerner)

q = flow coming to the geotextile
Δ_h = head loss = 2 ft (the depth of sand)
A = Area of geotextile through which flow will pass = 8.2 sf (per ft in the z direction)

$$\Psi_{req'd} = \frac{q}{(\Delta_h)(A)} = 0.01 \quad sec^{-1}$$

3. Check: $\Psi_{req'd}$ vs allowable permittivity, Ψ_{ult}, of the chosen geotextile

$$\Psi_{allow} = \frac{\Psi_{ult}}{FS_{SC} \times FS_{CR} \times FS_{IN} \times FS_{CC} \times FS_{BC}} \quad 1.19$$ (Koerner, Equation 2.25)

FS_{SC} = factor of safety for soil clogging	=	1	Soil clogging does not apply.
FS_{CR}= factor of safety for creep reduction	=	1	Creep does not apply.
FS_{IN}= factor of safety for intrusion	=	1	Intrusion does not apply.
FS_{CC}= factor of safety for chemical clogging	=	1.5	Table 2.12, Koerner (Attachment 4)
FS_{BC}= factor of safety for biological clogging	=	1.2	Table 2.12, Koerner (Attachment 4)

$$F.S., \text{ Factor of Safety} = \frac{\Psi_{allow}}{\Psi_{req'd}} = \frac{1.189}{0.007}$$ (Koerner, Equation 2.2a)

F.S. = 167

4. CONCLUSION, TASK 2 - DRAINAGE

Mirafi FW 402 woven geotextile has sufficient drainage characteristics to handle the peak conditions of leachate flow.

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140 Date: 6/11/2003

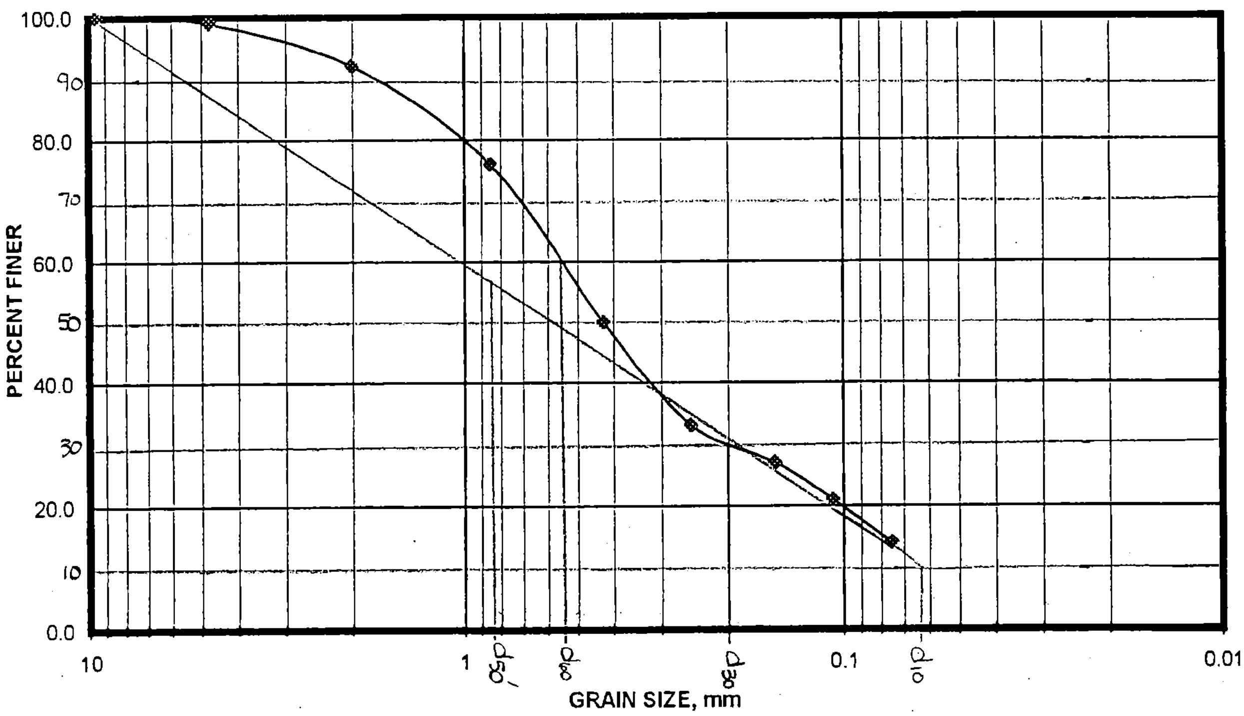
Project: Hardee County Landfill

Sample Location: TH5 13-15'

Soil Description:

Soil Classification: LL PI

GRAIN SIZE DISTRIBUTION



% Gravel	% Sand	%-200
1.0	85.0	14.0

D60	D30	D10	CC	CU

d_{10} = 0.064 MM
d_{30} = 0.200 MM
d_{60} = 0.550 MM
d_{50}' = 0.840 MM

Soil Boring TH-6

TH-6
1/4

SCS ENGINEERS		SHEET 1 of 3	
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT LCRS Geotextile Calculations Soil Boring: TH-6, 15 feet Below Surface		BY LEK	DATE 11/25/2003
		CHECKED JHO	DATE

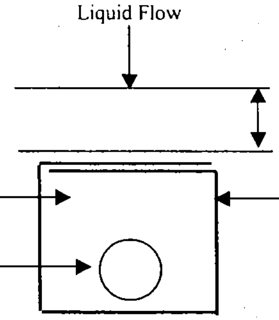
TASKS

1 Using Mirafi FW 402 Woven geotextile, determine if the geotextile will retain in situ sand.

2 Determine if Mirafi FW 402 has sufficient drainage characteristics to allow liquid to pass through.

KNOWN

LCRS Design



TASK 1 - GEOTEXTILE RETAINAGE

ASSUMED

Use particle size distribution for 2 ft of sand per FDOT Fine Aggregate Specifications (Attachment 1)

REFERENCES, TASK 1

* Mirafi Chart 4-1 "Soil Retention Criteria" for steady-state flow conditions. Received from Mirafi SE Sales. (Attachment 1)
* Principles of Geotechnical Engineering, 3rd ed., Braja M. Das, p. 23, "Effective Size, Uniformity Coefficient and Coefficient of Gradation" (Attachment 2).
* Mirafi Technical Data (Attachment 3).

SOLUTION, TASK 1

Sheet 4

1. From the Particle Size Distribution curve, find d_{10} $d_{10} = \boxed{0.045}$ mm

2. Follow Mirafi's chart and perform calculations for decision-making along the flowchart path applicable to the given situation.

a. Since d_{10} >0.075 mm and d_{10} < 4.8 mm, soil is less than 10% fines and less than 90% gravel.

b. The application is retention. Is the soil stable or unstable?

Calculate C_c

$$C_c = \frac{(d_{30})^2}{(d_{60})(d_{10})}$$

$d_{30} = \boxed{0.240}$ mm
$d_{60} = \boxed{0.330}$ mm

$C_c =$ 3.88

TH-6
2/4

SCS ENGINEERS

SHEET 2 of 3

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
LCRS Geotextile Calculations Soil Boring: TH-6, 15 feet Below Surface	LEK	11/25/2003
	CHECKED JHB	DATE

c. Stable Soil $1 <= C_c <= 3$ Unstable Soil $C_c > 3$ or $C_c < 1$

Soil is an unstable soil

$$C'u = \frac{d_{30}}{d_{10}}$$ to determine soil gradation.

C'u = 5.33

d. Widely Graded C'u >3 Uniformly Graded C'u < 3

Soil is widely graded

e. Using AOS of the chosen geotextile and d'_{50} of the soil, determine if the geotextile will work in varying densities of soil.

Apparent Opening Size, AOS= 0.425 mm

Calculate d'_{50}:

To find d'_{50}, draw a straight line through the extremities of the particle size distribution. Then d'_{50} is the midpoint of this line.

d'_{50} = 0.660 mm

Soil Densities					
Loose		**Medium**		**Dense**	
AOS < (9*d'_{50})/(C'u)		AOS < (13.5*d'_{50})/(C'u)		AOS < (18*d'_{50})/(C'u)	
AOS	(9d'_{50})/(C'u)	AOS	(13.5d'_{50})/(C'u	AOS	(18d'_{50})/(C'u)
0.425	1.114	0.425	1.671	0.425	2.228
OK		OK		OK	

3. CONCLUSION, TASK 1 - RETAINAGE

Mirafi FW 402 geotextile is applicable for the retainage of the given soil when the relative density loose, medium, or dense. ← ok

Note: Density is Relative Density, I_d

Loose Density	Medium Density	Dense
$I_d < 35\%$	$35\% < I_d < 65\%$	$I_d > 65\%$

TH-6
3/4

SCS ENGINEERS

SHEET 3 of 3

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
LCRS Geotextile Calculations Soil Boring: TH-6, 15 feet Below Surface	LEK	11/25/2003
	CHECKED JHO	DATE

Task 2 - FLOW THROUGH THE GEOTEXTILE

REFERENCES, TASK 2

* Designing with Geosynthetics, 3rd ed., Robert M. Koerner, Chapter 2
* HELP Model Output for Hardee County Landfill Expansion (Attachment 5)

SOLUTION, TASK 2

Mirafi FW 402 Permittivity, Ψ_{ult} = 2.14 sec^{-1}

Following Koerner's example, check flow capability.

1. Estimate maximum flow coming to the geotextile, q, in ft^3 / sec..

   Maximum flow occurs when the cell is open, prior to waste filling. The open cell will have 8 acres open.

   HELP Model: Open Cell run → Attachment H-6

   Peak daily flow = 10,078 cf/day = 0.117 cfs

2. From Koerner, calculate $\Psi_{req'd}$, required permittivity

$$\Psi_{req'd} = \frac{q}{(\Delta_h)(A)}$$ (Equation 2.16, Koerner)

q = flow coming to the geotextile
Δ_h = head loss = 2 ft (the depth of sand)
A = Area of geotextile through which flow will pass = 8.2 sf (per ft in the z direction)

$$\Psi_{req'd} = \frac{q}{(\Delta_h)(A)} = 0.01 \ sec^{-1}$$

3. Check: $\Psi_{req'd}$ vs allowable permittivity, Ψ_{ult}, of the chosen geotextile

$$\Psi_{allow} = \frac{\Psi_{ult}}{FS_{SC} \times FS_{CR} \times FS_{IN} \times FS_{CC} \times FS_{BC}} \quad 1.19$$ (Koerner, Equation 2.25)

FS_{SC} = factor of safety for soil clogging	=	1	Soil clogging does not apply.
FS_{CR}= factor of safety for creep reduction	=	1	Creep does not apply.
FS_{IN}= factor of safety for intrusion	=	1	Intrusion does not apply.
FS_{CC}= factor of safety for chemical clogging	=	1.5	Table 2.12, Koerner (Attachment 4)
FS_{BC}= factor of safety for biological clogging	=	1.2	Table 2.12, Koerner (Attachment 4)

$$\text{F.S., Factor of Safety} = \frac{\Psi_{allow}}{\Psi_{req'd}} = \frac{1.189}{0.007}$$ (Koerner, Equation 2.2a)

F.S. = 167

4. CONCLUSION, TASK 2 - DRAINAGE

   Mirafi FW 402 woven geotextile has sufficient drainage characteristics to handle the peak conditions of leachate flow.

TH-6
4/4

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140 Date: 6/11/2003

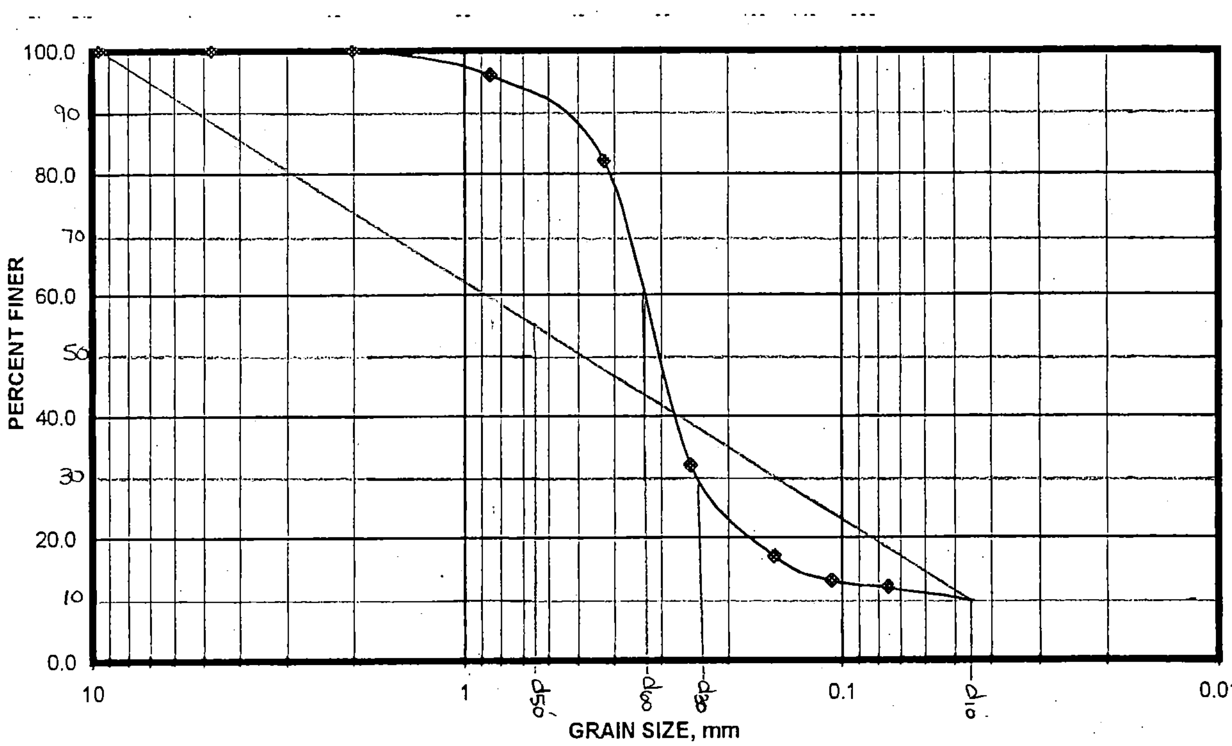
Project: Hardee County Landfill

Sample Location: TH6 15'

Soil Description:

Soil Classification: LL PI

GRAIN SIZE DISTRIBUTION



% Gravel	% Sand	%-200
0.0	88.0	12.0

D60	D30	D10	CC	CU

d_{10} = 0.045 MM

d_{30} = 0.240 MM

d_{60} = 0.330 MM

d_{50}' = 0.660 MM

Soil Boring TH-7

TH-7
1/4

SCS ENGINEERS

SHEET 1 of 3

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
LCRS Geotextile Calculations Soil Boring: TH-7, 5 feet Below Surface	LEK	11/25/2003
	CHECKED JHO	DATE

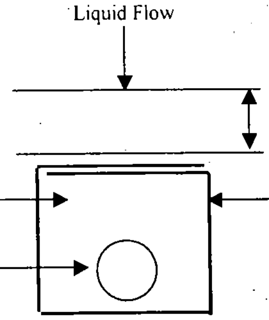
TASKS

1 Using Mirafi FW 402 Woven geotextile, determine if the geotextile will retain in situ sand.

2 Determine if Mirafi FW 402 has sufficient drainage characteristics to allow liquid to pass through.

KNOWN

LCRS Design



TASK 1 - GEOTEXTILE RETAINAGE

ASSUMED

Use particle size distribution for 2 ft of sand per FDOT Fine Aggregate Specifications (Attachment 1)

REFERENCES, TASK 1

* Mirafi Chart 4-1 "Soil Retention Criteria" for steady-state flow conditions. Received from Mirafi SE Sales. (Attachment 1)
* Principles of Geotechnical Engineering, 3rd ed., Braja M. Das, p. 23, "Effective Size, Uniformity Coefficient and Coefficient of Gradation" (Attachment 2).
* Mirafi Technical Data (Attachment 3).

SOLUTION, TASK 1 Sheet 4

1. From the Particle Size Distribution curve, find d_{10} $d_{10} = \boxed{0.075}$ mm

2. Follow Mirafi's chart and perform calculations for decision-making along the flowchart path applicable to the given situation.

a. Since d_{10} >0.075 mm and d_{10} < 4.8 mm, soil is less than 10% fines and less than 90% gravel.

b. The application is retention. Is the soil stable or unstable?

Calculate C_c

$$C_c = \frac{(d_{30})^2}{(d_{60})(d_{10})}$$

$d_{30} = \boxed{0.120}$ mm

$d_{60} = \boxed{0.180}$ mm

$C_c =$ 1.07

TH-7
2/4

SCS ENGINEERS

SHEET 2 of 3

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
LCRS Geotextile Calculations Soil Boring: TH-7, 5 feet Below Surface	LEK	11/25/2003
	CHECKED JHO	DATE

c. Stable Soil $1 <= C_c <= 3$ — Unstable Soil $C_c > 3$ or $C_c < 1$

Soil is a stable soil

$$C'u = \frac{d_{60}}{d_{30}}$$ to determine soil gradation.

C'u = 1.50

d. Widely Graded C'u >3 — Uniformly Graded C'u < 3

Soil is uniformly graded

e. Using AOS of the chosen geotextile and d'_{50} of the soil, determine if the geotextile will work in varying densities of soil.

Apparent Opening Size, AOS= 0.425 mm

Calculate d'_{50}:
To find d'_{50}, draw a straight line through the extremities of the particle size distribution. Then d'_{50} is the **midpoint** of this line.

d'_{50} = 0.82 mm

Soil Densities					
Loose		**Medium**		**Dense**	
AOS < (C'u)(d'_{50})		AOS < 1.5(C'u)(d'_{50})		AOS < 2(C'u)(d'_{50})	
AOS	(C'u)(d'_{50})	AOS	1.5(C'u)(d'_{50})	AOS	2(C'u)(d'_{50})
0.425	1.230	0.425	1.845	0.425	2.460
OK		OK		OK	

3. CONCLUSION, TASK 1 - RETAINAGE

Mirafi FW 402 geotextile is applicable for the retainage of the given soil when the relative density loose, medium, or dense. OK

Note: Density is Relative Density, I_d

Loose Density	Medium Density	Dense
$I_d < 35\%$	$35\% < I_d < 65\%$	$I_d > 65\%$

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
LCRS Geotextile Calculations Soil Boring: TH-7, 5 feet Below Surface		LEK	11/25/2003
		CHECKED JAO	DATE

Task 2 - FLOW THROUGH THE GEOTEXTILE

REFERENCES, TASK 2

- Designing with Geosynthetics, 3rd ed., Robert M. Koerner, Chapter 2
- HELP Model Output for Hardee County Landfill Expansion (Attachment 5)

SOLUTION, TASK 2

Mirafi FW 402 Permittivity, Ψ_{ult} = 2.14 sec^{-1}

Following Koerner's example, check flow capability.

1. Estimate maximum flow coming to the geotextile, q, in ft^3 / sec..

Maximum flow occurs when the cell is open, prior to waste filling. The open cell will have 2 acres open.

HELP Model: Open Cell run ⟶ Attachment H-6

Peak daily flow = 10,078 cf/day = 0.117 cfs

2. From Koerner, calculate $\Psi_{req'd}$, required permittivity

$$\Psi_{req'd} = \frac{q}{(\Delta_h)(A)}$$ (Equation 2.16, Koerner)

q = flow coming to the geotextile
Δ_h = head loss = 2 ft (the depth of sand)
A = Area of geotextile through which flow will pass = 8.2 sf (per ft in the z direction)

$$\Psi_{req'd} = \frac{q}{(\Delta_h)(A)} = 0.01 \ sec^{-1}$$

3. Check: $\Psi_{req'd}$ vs allowable permittivity, Ψ_{ult}, of the chosen geotextile

$$\Psi_{allow} = \frac{\Psi_{ult}}{FS_{SC} \times FS_{CR} \times FS_{IN} \times FS_{CC} \times FS_{BC}} \quad 1.19$$ (Koerner, Equation 2.25)

FS_{SC} = factor of safety for soil clogging	=	1	Soil clogging does not apply.
FS_{CR} = factor of safety for creep reduction	=	1	Creep does not apply.
FS_{IN} = factor of safety for intrusion	=	1	Intrusion does not apply.
FS_{CC} = factor of safety for chemical clogging	=	1.5	Table 2.12, Koerner (Attachment 6)
FS_{BC} = factor of safety for biological clogging	=	1.2	Table 2.12, Koerner (Attachment 6)

$$F.S., \text{Factor of Safety} = \frac{\Psi_{allow}}{\Psi_{req'd}} = \frac{1.189}{0.007}$$ (Koerner, Equation 2.2a)

F.S. = 167

4. CONCLUSION, TASK 2 - DRAINAGE

Mirafi FW 402 woven geotextile has sufficient drainage characteristics to handle the peak conditions of leachate flow.

TH-7
4/4

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

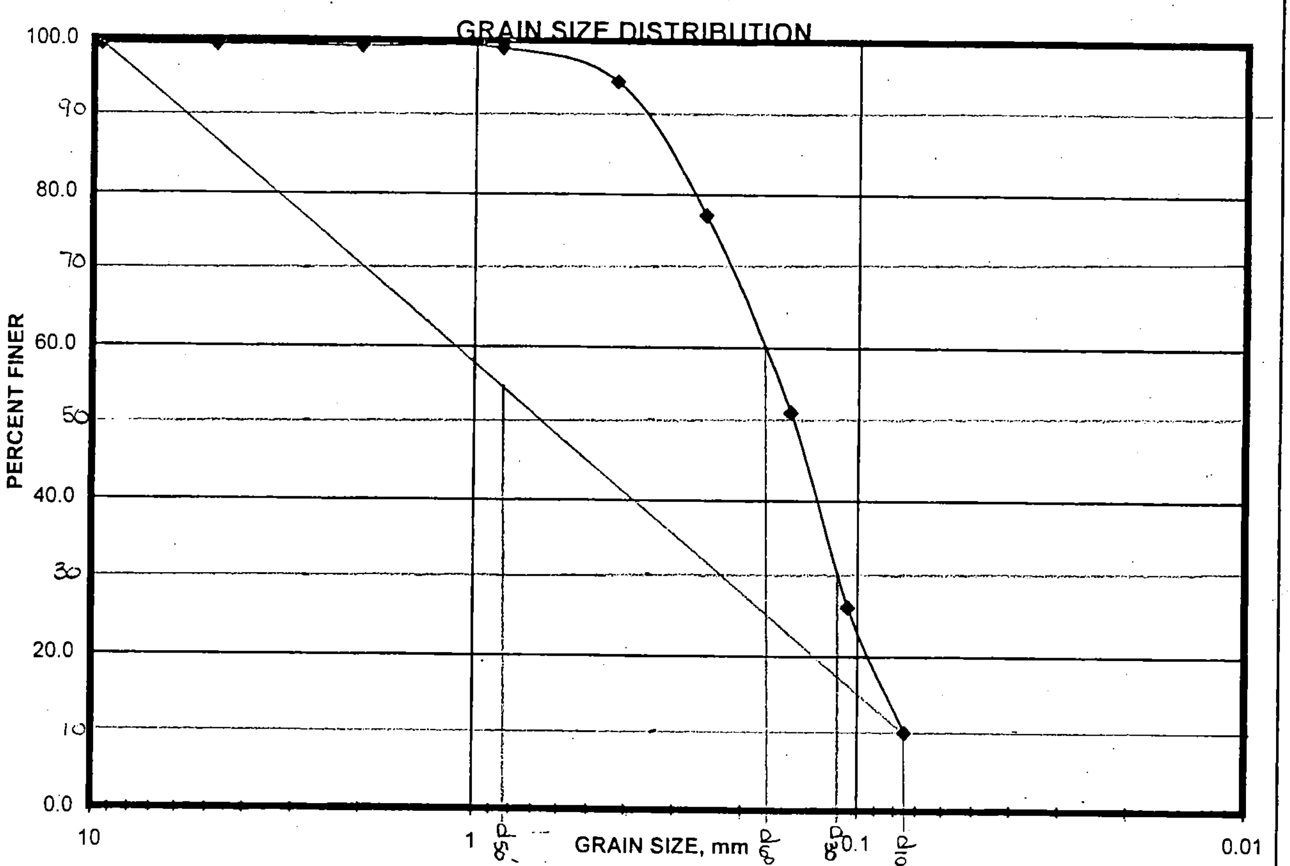
Project No. 35140 Date: 5/27/2003

Project: Hardee County Landfill

Sample Location: TH7 5'

Soil Description: 0

Soil Classification: 0 LL ______ PI ______



% Gravel	% Sand	%-200
0.6	89.3	10.1

D60	D30	D10	CC	CU

d_{10} = 0.075 MM

d_{30} = 0.120 MM

d_{60} = 0.180 MM

d_{50}' = 0.820 MM

Attachments

Source : TC Mirafi

4. GEOTEXTILE FILTER DESIGN CRITERIA

4.1 Overview

This section presents design criteria for geotextile filters. Specifically, the following are presented:

- Section 4.2 - Application Requirements of Filters;
- Section 4.3 - Soil Retention Criteria;
- Section 4.4 - Geotextile Permeability Criteria;
- Section 4.5 - Anti-Clogging Criteria;
- Section 4.6 - Survivability Criteria;
- Section 4.7 - Durability Criteria; and
- Section 4.8 - Miscellaneous Considerations.

4.2 Application Requirements of Filters

Different filter applications require different performances of the filter. Of course all applications would ideally have a filter that provides <u>sufficient</u> soil retention while maintaining <u>sufficient</u> permeability. The question arises, however, what is "sufficient"?

As discussed in Section 2.1, many soils are internally stable. These soils quickly form a filter bridge or filter cake that satisfies soil retention <u>and</u> permeability requirements. If, however, a soil demonstrates an unstable structure (as will be further discussed in the following sections), then the designer must accept the fact that the fine soil particles will either have to be released through the filter, or will have to build up against or within the filter. In other terms, either the retention performance or the permeability performance of the filter will have to be compromised. This "retention vs. permeability trade-off" must be approached on a case by case basis, by considering the consequences of insufficient soil retention or insufficient permeability for the given application.

4.3 Soil Retention Criteria

4.3.1 Overview

Soil retention is essentially the study of soil-particle movement. Soil particles move when the forces generating movement (i.e., the flow conditions) are greater than the forces resisting movement. The flow conditions which generate soil-particle movement were described in Section 3.1.2. This section describes the mechanisms that aid in resisting soil-particle movement. Specific retention criteria are then provided for both steady-state and dynamic-state flow conditions.

There are two mechanisms by which particle movement is resisted:

- granular soil particles (i.e., particles with diameters larger than 0.075 mm) are generally held in place by interlocking of the particulate soil structure; and
- fine-grained soil particles (i.e., particles with diameters smaller than 0.075 mm) are generally held in place by their cohesion.

4.3.2 Background Information of Granular Soils

The ability of granular soil particles to resist movement by interlocking is a measure of the internal stability of the soil, which is a function of the soil particle-size distribution. Several parameters are useful in describing characteristics of the soil particle-size distribution curve. Three of the more useful parameters for filtration design purposes are as follows:

- Coefficient of Uniformity, C_u, is a measure of the slope of the finer portion of the particle-size distribution curve of a soil. Defined as the ratio of the d_{60} size particle over the d_{10} size particle, the C_u value is determined by the following equation:

$$C_u = \frac{d_{60}}{d_{10}} \qquad \text{(Equation 4-1)}$$

A soil that exhibits a wide distribution of particle sizes will necessarily have a large C_u value. A soil with a uniform distribution of particle sizes will have a low C_u value. Figure 4-1A shows examples of widely-graded, uniformly-graded, and gap-graded soils along with their respective C_u values.

- Linear Coefficient of Uniformity, C'_u, is a measure of the slope of a straight line approximation of the soil particle-size distribution curve. Mathematically, the following rule is true of a straight line drawn on a semi-logarithmic particle-size distribution graph:

$$C'_u = \frac{d'_{50}}{d'_0} = \frac{d'_{60}}{d'_{10}} = \frac{d'_{70}}{d'_{20}} \ldots \frac{d'_{100}}{d'_{50}} = \sqrt{\frac{d'_{100}}{d'_0}} \qquad \text{(Equation 4-2)}$$

where: d'_x is the equivalent d_x obtained from the straight line approximation of the particle-size distribution curve.

Hence, if a straight line approximation is drawn through a soil particle-size distribution, then the linear coefficient of uniformity can be calculated using Equation 4-2.

As with the conventional Coefficient of Uniformity, a widely-distributed soil will have a larger value of C'_u than a uniformly-graded soil. Figure 4-1B shows examples of widely-graded, uniformly-graded, and gap-graded soils, along with their respective C'_u values. Note that a gap-graded soil may have different values of C'_u, depending on what portion of the curve is used to draw the straight line.

- Coefficient of Curvature, C_c, provides a measure of how curved the finer portion of the particle-size distribution is. The Coefficient of Curvature is the ratio of the slope of a line drawn through d_{30} and d_{10} to the slope of a line drawn through d_{60} and d_{30}. Hence, the Coefficient of Curvature is calculated by the following equation:

$$C_c = \frac{d_{30}/d_{10}}{d_{60}/d_{30}} = \frac{(d_{30})^2}{d_{60} \times d_{10}} \qquad \text{(Equation 4-3)}$$

  If a soil exhibits a particle-size distribution curve that is "concave up" between the limits of d_{60} and d_{10}, then C_c will be greater than 1. If the particle-size distribution is relatively straight within these limits, then C_c will be approximately equal to 1. If the particle-size distribution is "concave-down" within these limits, then C_c will be less than 1.

  The Coefficient of Curvature may also be used to identify gap-graded soils, which often exhibit a "concave-up" shape of the particle-size distribution curve. Figure 4-1C shows examples of widely-graded, uniformly-graded, and gap-graded soils, along with their respective C_c values.

The internal stability of a granular soil is a function of the particle-size distribution. The three parameters C_u, C'_u and C_c are important to filtration design because they are relative indicators of the distribution of particles within a given soil matrix. The importance aspects of each of these three parameters are summarized as follows:

- The Coefficient of Uniformity, C_u, is a commonly used parameter that quantifies how widely distributed the particle-size curve is. The C_u value is important because it has been shown theoretically and experimentally that soils with a C_u value of approximately 3 are capable of obtaining the highest densities [Giroud, 1982; Horsfield, 1934]. This indicates that the finer soil particles effectively fill the void spaces within the soil matrix, and as such, the particles are highly interlocked. When C_u is greater than 3, the wide distribution of particle sizes decreases the potential for interlocking. Hence, soils that are very widely distributed tend to be internally less stable than soils with relatively uniform particle-size distributions.

- The Linear Coefficient of Uniformity, C'_u, was developed by Giroud [1982] as a component of the retention criteria because the straight line approximation can be applied to the "significant" portion of the particle-size distribution curve. For example, it may in some cases be most appropriate to use the slope of the central portion of the curve, thus eliminating the coarsest and finest particles. In other cases, it may be appropriate to use the slope of the lower (i.e., the fine) portion of the curve, thus eliminating the coarse particles. Establishing the C'_u value also allows for convenient mathematical expressions for defining the maximum allowable opening size of the filter. Further importance aspects of the C'_u value are presented in Section 4.3.4.1.

- The Coefficient of Curvature, C_c, is important because it provides a quantitative process for identifying problematic (i.e., unstable) soils. Granular soils that demonstrate "concave-up" particle-size distribution curves, or gap-graded curves, are usually the least stable when subjected to flow conditions. Further importance aspects of the C_c value are presented in Section 4.3.4.1.

The process by which the C_u, C'_u, and C_c parameters are used for filtration design is presented in Sections 4.3.4 and 4.3.5 of this manual.

4.3.3 Background Information of Fine-Grained Soils

The ability of fine-grained soil particles to resist movement is referred to as the internal stability of the soil, and is a function of the soil cohesion and dispersion potential. Several parameters have been identified as useful in describing these characteristics of fine-grained soils. Two of the more useful parameters for filtration design purposes are as follows:

- Plasticity Index, PI, is a measure of the range of moisture over which a soil exhibits plastic (cohesive) behavior. The PI value of a soil is determined from the Atterberg Limits Test (ASTM D 4318). A soil that exhibits a high PI value (greater than 5 to 10) may have cohesive properties, and therefore, greater resistance to particle movement under flow conditions.

- Double Hydrometer Ratio, DHR, is a measure of the dispersion potential of fine-grained soils. Experience has indicated that some soils, although exhibiting plastic behavior, tend to disperse under flow conditions. This is potentially very dangerous, since the dispersed fine particles do not possess the ability to interlock and do not maintain stability from cohesion. The DHR is determined from the Double Hydrometer Test (ASTM D 4221). A soil that exhibits DHR values greater than about 0.5 may exhibit dispersive characteristics when subjected to flow conditions. Alternatively, soils that exhibit DHR values less than about 0.5 will likely be held together by their cohesive properties except under severely dynamic flow conditions.

4.3.4 Soil Retention Criteria for Steady-State Flow

Soil retention criteria for steady-state flow conditions were originally established by Giroud [1982], and have been modified for this manual. The various criteria are dependent on the soil properties and are therefore presented separately for granular soils and fine-grained soils. Chart 4-1 provides a flowchart to guide in the selection of soil retention criteria for all soils when subjected to steady-state flow conditions.

4.3.4.1 Granular Soils

If the soil contains less than 10 percent fines, then for filtration design purposes, the soil is considered granular. In addition, if the soil contains more than 10 percent fines, but the plasticity of the soil is low (PI < 5), then the soil is considered granular. The lower half of Chart 4-1 demonstrates how to determine granular soil retention criteria for steady-state flow conditions.

If the soil is determined to be granular, the steady-state retention design methodology is as follows:

- Calculate the coefficient of curvature, C_c, using the particle-size distribution curve and the previously defined Equation 4-3.

- Depending on the primary requirement of the filter (i.e., retention or permeability), and the coefficient of curvature of the soil, trace a straight line using the significant portion of the soil particle-size distribution curve as directed by the criteria in Table 4-2.

- Obtain the values of d'_o and d'_{100} at the two extremities of this straight line, and d'_{50} at the center point of the line. Calculate the linear coefficient of uniformity, C'_u, of the soil using the particle-size distribution curve and the previously defined Equation 4-2.

- Determine the anticipated relative density, I_D, of the soil, which can be obtained from project-specific information (such as construction specifications). Alternatively, in non-critical applications, relative density can be estimated using Table 4-3.

- Using the linear coefficient of uniformity, C'_u, and the relative density, I_D, obtain the appropriate apparent opening size, O_{95}, of the geotextile filter using Table 4-4.

4.3.4.2 Fine-Grained Soils

If the soil contains more than 10 percent fine-size particles and the plasticity is high enough (PI > 5) to lend cohesion to the soil structure, then the soil is considered fine-grained. The upper half of Chart 4-1 demonstrates how to determine fine-grained soil retention criteria for steady-state flow conditions.

If the soil is fine-grained, the steady-state retention design methodology is as follows:

- If the soil is determined to be non-dispersive (DHR < 0.5), then O_{95} must be less than 0.21 mm (i.e., less than # 70 sieve opening size).

- If the soil has a high dispersion potential (DHR > 0.5), then a layer of fine sand should be used between the soil and the geotextile. Fine sand is defined as soil having particle diameters that range from 0.075 mm to 0.4 mm. This layer typically ranges in thickness from 3 to 6 in. (75 to 150 mm). The geotextile should then be designed as a filter for the fine sand, using the granular criteria set forth in Section 4.3.4.1.

4.3.5 Soil Retention Criteria for Dynamic Flow

Soil retention criteria for dynamic-state flow conditions were originally established by Heerten [1985] and have been modified for this manual. As with steady-state flow, the various criteria are dependent on the soil properties and therefore are presented separately for granular soils and fine-grained soils. Chart 4-2 provides a condensed flowchart for the selection of soil retention criteria for all soils when subjected to dynamic-state flow conditions.

4.3.5.1 Granular Soils

If the soil contains less than 50 percent fines, then for filtration design purposes, the soil is considered granular. Alternatively, if the soil contains more than 50 percent fines, but the plasticity of the soil is low (PI < 5), then the soil is considered granular. The lower half of Chart 4-2 demonstrates how to determine the granular soil retention criteria for dynamic flow conditions.

If the soil is determined to be granular, the dynamic-state retention design methodology is as follows:

- If the dynamic flow conditions are the result of severe wave attack, then O_{95} must be less than d_{50} of the soil.

- If the flow conditions are the result of mild water currents, then determine the coefficient of uniformity using the particle-size distribution curve and the previously defined Equation 4-1.

  - For widely-graded soils ($C_u > 5$), O_{95} must simultaneously be less than 2.5 d_{50}, and O_{95} must be less than d_{90}.

  - For uniformly-graded soils ($C_u \le 5$), O_{95} should be greater than d_{50}, but less than d_{90}.

4.3.5.2 Fine-Grained Soils

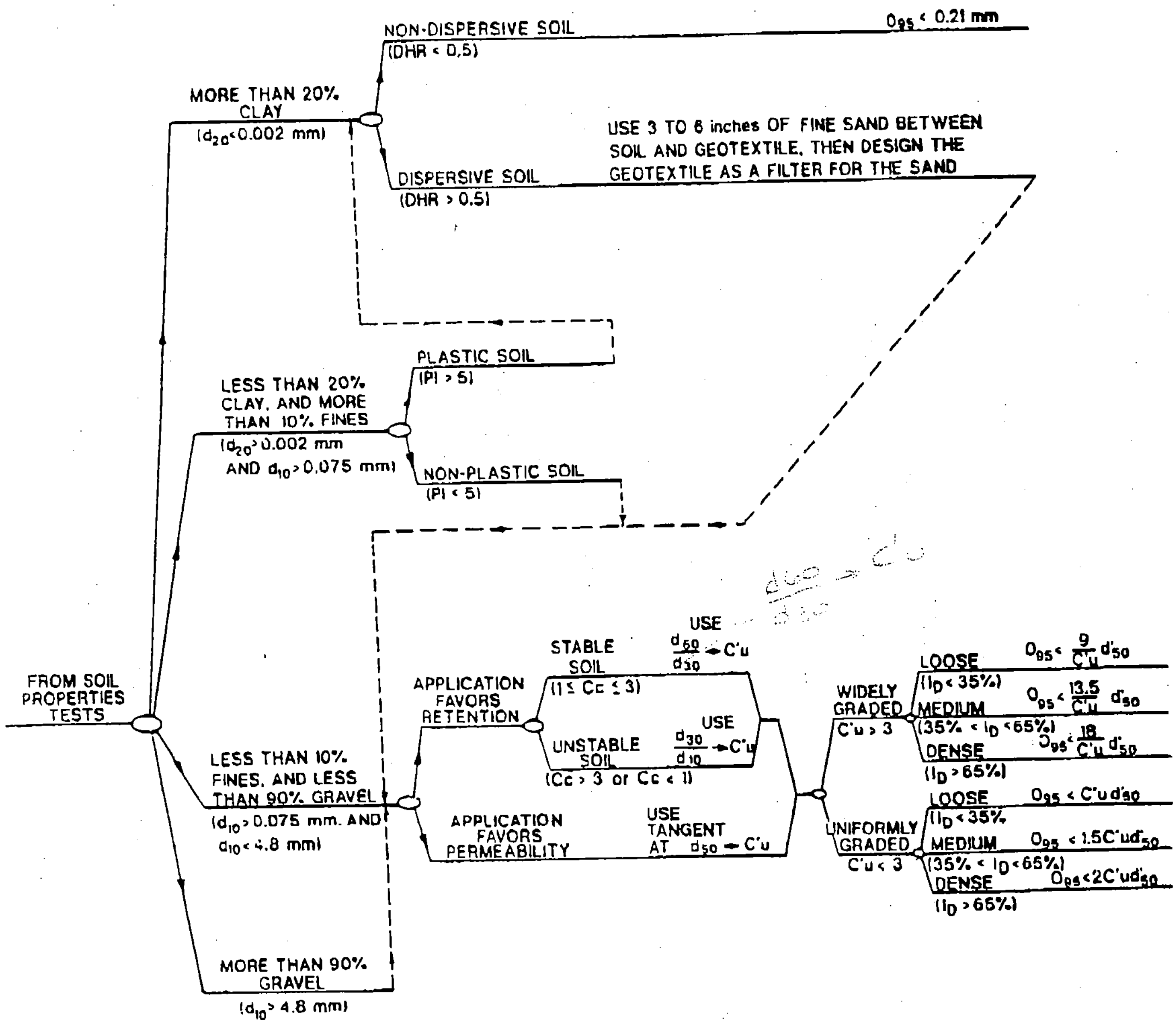
If the soil contains more than 50 percent fine-size particles, and the plasticity is high enough (PI > 5) to lend cohesion to the soil structure, then the soil is considered fine-grained. The upper half of Chart 4-2 demonstrates how to determine the fine-grained soil retention criteria for dynamic flow conditions.

If the soil is fine-grained, the dynamic-state retention design methodology is as follows:

- If the soil is non-dispersive (DHR < 0.5): the geotextile O_{95} must be less than 10 d_{50}; O_{95} must be less than d_{90}; and O_{95} must be less than 0.1 mm.

- If the soil has a high dispersion potential (DHR > 0.5): a layer of fine sand should be used between the soil and the geotextile. This layer typically ranges in thickness from 3 to 6 in. (75 to 150 mm). The geotextile should be designed as a filter for the fine sand, using the granular criteria set forth in Section 4.3.4.1.

CHART 4-1
SOIL RETENTION CRITERIA FOR STEADY-STATE FLOW CONDITIONS



NOTES:

d_x is the particle size of which x percent is smaller

$C'u = \sqrt{\dfrac{d'_{100}}{d'_0}}$ where: d'_{100} and d'_0 are the extremities of a straight line drawn through the particle-size distribution, as directed above; and d'_{50} is the midpoint of this line.

$Cc = \dfrac{(d_{30})^2}{d_{60} \times d_{10}}$

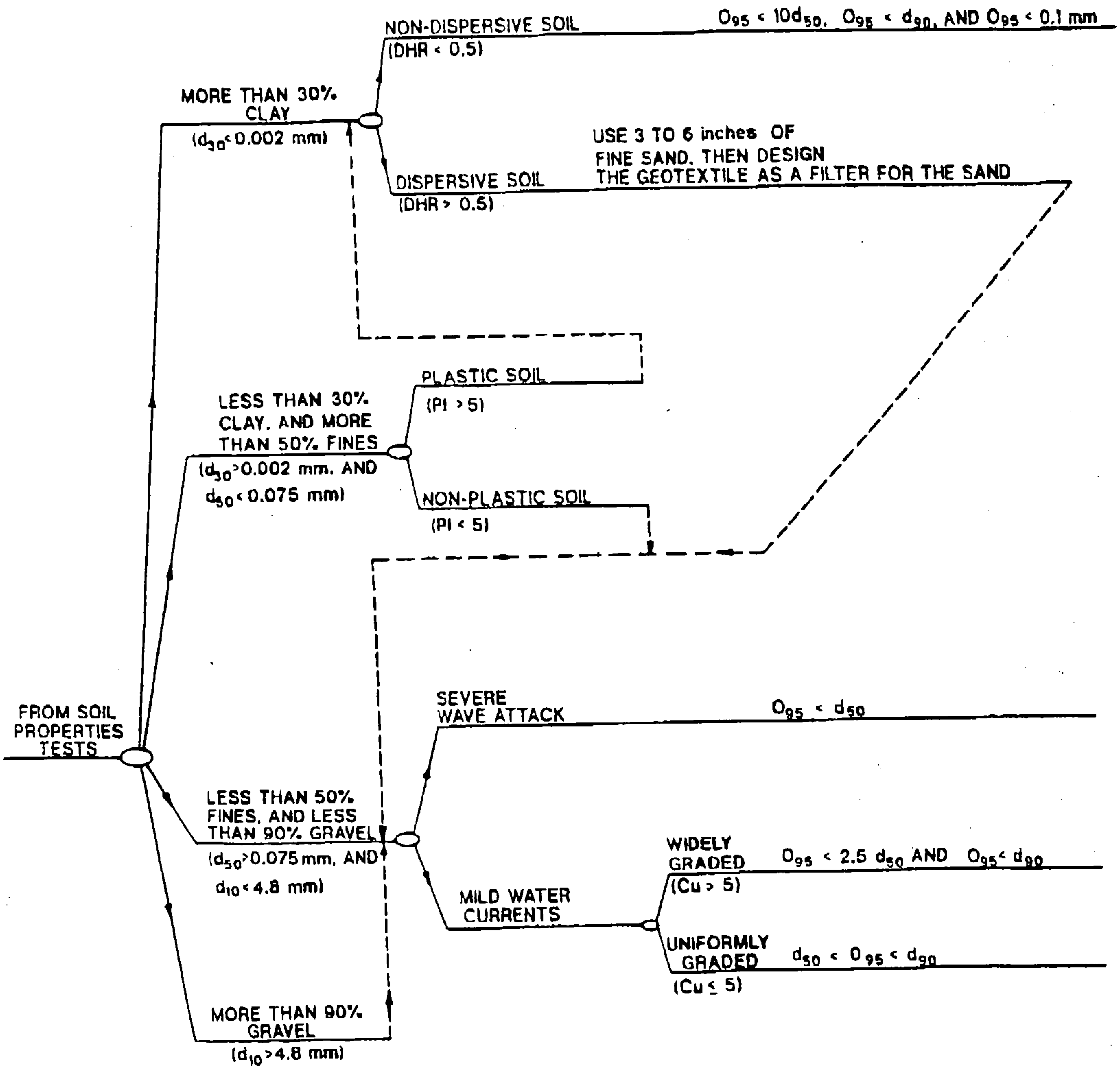
I_D is the relative denisty of the soil

PI is the plasticity index of the soil

DHR is the double-hydrometer ratio of the soil

Portions of this flow chart modified from Giroud (1988)

CHART 4-2
SOIL RETENTION CRITERIA FOR DYNAMIC FLOW CONDITIONS



NOTES:

$$C_u = \frac{d_{60}}{d_{10}}$$

d_x is the soil particle size of which x percent is smaller
PI is the plasticity index of the soil
DHR is the double-hydrometer ratio of the soil
O_{95} is the geotextile opening size
Portions of this flow chart modified from Heerten (1985)

ATTACHMENT 2
1/1

1.6 EFFECTIVE SIZE, UNIFORMITY COEFFICIENT, AND COEFFICIENT OF GRADATION

The particle-size distribution curves can be used for comparing different soils. Also, three basic soil parameters can be determined from these curves, and they can be used to classify granular soils. These parameters are:

1. Effective size
2. Uniformity coefficient
3. Coefficient of gradation

The diameter in the particle-size distribution curve corresponding to 10% finer is defined as the *effective size*, or D_{10}. The *uniformity coefficient* is given by the relation

$$\boxed{C_u = \frac{D_{60}}{D_{10}}} \tag{1.7}$$

where C_u = uniformity coefficient
D_{60} = the diameter corresponding to 60% finer in the particle-size distribution curve

The *coefficient of gradation* may be expressed as

$$\boxed{C_c = \frac{D_{30}^2}{D_{60} \times D_{10}}} \tag{1.8}$$

where C_c = coefficient of gradation
D_{30} = diameter corresponding to 30% finer

For the particle-size distribution curve of soil B shown in Figure 1.16, the values of D_{10}, D_{30}, and D_{60} are 0.096 mm, 0.16 mm, and 0.24 mm, respectively. The uniformity coefficient and coefficient of gradation are

$$C_u = \frac{D_{60}}{D_{10}} = \frac{0.24}{0.096} = 2.5$$

$$C_c = \frac{D_{30}^2}{D_{60} \times D_{10}} = \frac{(0.16)^2}{0.24 \times 0.096} = 1.11$$

The particle-size distribution curve shows not only the range of particle sizes present in a soil but also the type of distribution of various size particles. This is demonstrated in Figure 1.17. Curve I represents a type of soil in which most of the soil grains are the same size. This is called *poorly graded* soil. Curve II represents a soil in

Technical Data

MIRAFI

The Original Geosynthetics Company

Attachment. 3

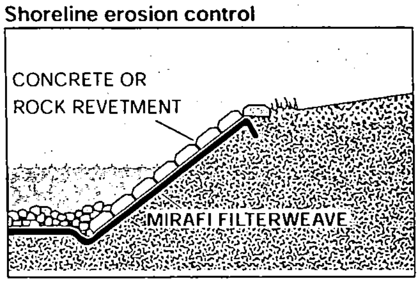
product Mirafi® Filterweave® Woven Geotextiles

for Erosion Control and Filtration

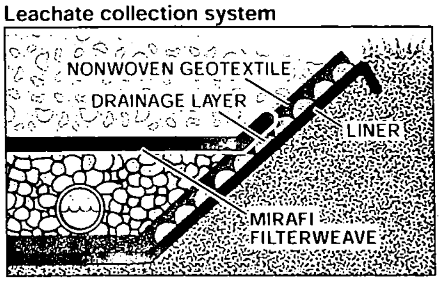
Property / Test Method	Units	FW 300	FW 400	FW 402	FW 403	FW 404	FW 500	FW 700
MECHANICAL PROPERTIES								
Wide Width Tensile Strength ASTM D 4595								
MD @ Ultimate	kN/m (lbs/ft)	40 (2760)	26 (1800)	35 (2400)	47 (3240)	44 (3080)	32 (2200)	40 (2700)
CMD @ Ultimate	kN/m (lbs/ft)	39 (2700)	29 (1980)	24 (1680)	39 (2700)	40 (2760)	44 (3000)	26 (1740)
Grab Tensile Strength ASTM D 4632								
MD @ Ultimate	kN (lbs)	1.78 (400)	1.18 (265)	1.62 (365)	1.89 (425)	1.78 (400)	1.45 (325)	1.65 (370)
CMD @ Ultimate	kN (lbs)	1.49 (335)	1.13 (255)	0.89 (200)	1.56 (350)	1.40 (315)	1.89 (425)	1.11 (250)
MD Elongation @ Ultimate	%	20	16	24	21	15	15	16
CMD Elongation @ Ultimate	%	15	15	10	21	15	15	15
Mullen Burst Strength ASTM D 3786	kN (lbs)	4473 (650)	3441 (500)	3097 (450)	4479 (650)	5506 (800)	5171 (750)	3097 (450)
Trapezoidal Tear Strength ASTM D 4533								
MD @ Ultimate	kN (lbs)	0.65 (145)	0.36 (80)	0.51 (115)	0.65 (145)	0.67 (150)	0.60 (135)	0.45 (100)
CMD @ Ultimate	kN (lbs)	0.56 (125)	0.31 (70)	0.33 (75)	0.56 (125)	0.73 (165)	0.67 (150)	0.27 (60)
Puncture Strength ASTM D 4833	kN (lbs)	0.56 (125)	0.56 (125)	0.40 (90)	0.67 (150)	0.67 (150)	0.62 (140)	0.53 (120)
UV Resistance after 500 hrs. ASTM D 4355	% Strength	90	90	90	90	90	70	90
HYDRAULIC PROPERTIES								
Apparent Opening Size (AOS) ASTM D 4751	mm (US Sieve)	0.600 (30)	0.425 (40)	0.425 (40)	0.425 (40)	0.425 (40)	0.300 (50)	0.212 (70)
Permittivity ASTM D 4491	sec^{-1}	1.50	0.95	2.14	0.96	0.90	0.506	0.28
Percent Open Area COE-02215-86	%	8	10	10	6	NP	4	4-6
Flow Rate ASTM D 4491	$l/min/m^2$ ($gal/min/ft^2$)	4685 (115)	2852 (70)	5907 (145)	2852 (70)	2852 (70)	1426 (35)	733 (18)
Packaging								
Roll Width	m (ft)	3.8 (12.5)	3.7 (12)	3.8 (12.5)	3.8 (12.5)	4.5 (15)	3.7 (12)	3.7 (12)
Roll Length	m (ft)	91 (300)	91 (300)	91 (300)	91 (300)	91 (300)	91 (300)	91 (300)
Est. Gross Weight	kg (lbm)	99 (221)	64 (140)	76 (168)	100 (221)	120 (265)	75 (165)	80 (176)
Area	m^2 (yd^2)	348 (417)	334 (400)	348 (417)	348 (417)	418 (500)	334 (400)	334 (400)

**NOTE: All Mechanical Properties and Hydraulic Properties shown are Minimum Average Roll Values (MARV).*
NP - Not Published

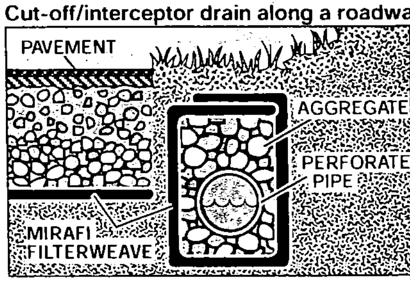
Shoreline erosion control



Leachate collection system



Cut-off/interceptor drain along a roadway



www.tcnicolon.com

TECHNICAL SERVICES
Complete technical assistance is available from Ten Cate Nicolon and its sales representatives. Service include assistance during design and specification stages as well as initial stages of installation.

WARRANTY
Ten Cate Nicolon warrants that the product that it sells will conform to the specifications published in this literature. For information on limitations to this warranty, contact Ten Cate Nicolon.

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Ten Cate Nicolon

LT.PDS.FW.0403

Design w/ Geosynthetics
Robert M Koerner
3rd Edition

Attachment 4

Table 2.12 Recommended partial factor of safety values for use in Equation 2.24

Application Area	Various Partial Factors of Safety: Installation Damage	Creep*	Chemical Degradation	Biological Degradation
Separation	1.1 to 2.5	1.5 to 2.5	1.0 to 1.5	1.0 to 1.2
Cushioning	1.1 to 2.0	1.2 to 1.5	1.0 to 2.0	1.0 to 1.2
Unpaved roads	1.1 to 2.0	1.5 to 2.5	1.0 to 1.5	1.0 to 1.2
Walls	1.1 to 2.0	2.0 to 4.0	1.0 to 1.5	1.0 to 1.3
Embankments	1.1 to 2.0	2.0 to 3.5	1.0 to 1.5	1.0 to 1.3
Bearing capacity	1.1 to 2.0	2.0 to 4.0	1.0 to 1.5	1.0 to 1.3
Slope stabilization	1.1 to 1.5	2.0 to 3.0	1.0 to 1.5	1.0 to 1.3
Pavement overlays	1.1 to 1.5	1.0 to 2.0	1.0 to 1.5	1.0 to 1.1
Railroads	1.5 to 3.0	1.0 to 1.5	1.5 to 2.0	1.0 to 1.2
Flexible forms	1.1 to 1.5	1.5 to 3.0	1.0 to 1.5	1.0 to 1.1
Silt fences	1.1 to 1.5	1.5 to 2.5	1.0 to 1.5	1.0 to 1.1

*The low end of the range refers to applications which have relatively short service lifetimes and/or situations where creep deformations are not significant to the overall system performance.

Note that this equation could just as well have been formulated as fractional multipliers (values ≤ 1.0) and placed in the numerator of the equation. It is placed in this form because other studies have done likewise (e.g., Voskamp and Risseeuw [58]). While the equation indicates tensile strength, it can be applied equally well to burst strength, tear strength, puncture strength, impact strength, etc.

For problems dealing with flow through or within a geotextile, the formulation takes the following form with typical values given in Table 2.13. Note that these values must be tempered by the site-specific conditions as was the case with the previous table.

$$q_{\text{allow}} = q_{\text{ult}}\left(\frac{1}{FS_{SCB} \times FS_{CR} \times FS_{IN} \times FS_{CC} \times FS_{BC}}\right) \tag{2.25}$$

where q_{allow} = the allowable flow rate,
q_{ult} = the ultimate flow rate,
FS_{SCB} = the factor of safety for soil clogging and blinding,
FS_{CR} = the factor of safety for creep reduction of void space,
FS_{IN} = the factor of safety for adjacent materials intruding into geotextile's void space,
FS_{CC} = the factor of safety for chemical clogging, and
FS_{BC} = the factor of safety for biological clogging.

DESIGNING FOR SEPARATION

Specific application areas for geotextiles being used in the separation function were given in Section 1.3.3. There are indeed many specific uses, and one could say in a general sense that geotextiles always serve a separation function. Indeed, if they

ATTACHMENT H-9

STORMWATER MANAGEMENT SYSTEM CALCULATIONS
(Calculations and Supporting Documentation presented in the Environmental Resource Permit Application submitted in conjunction with the Solid Permit Application)

ATTACHMENT H-10

LEACHATE BALANCE

HARDEE COUNTY
BOARD OF COUNTY COMMISSIONERS
412 W. Orange Street, Room 103
Wauchula, Florida 33873
(863)773-9430 * (863)773-6952 * Fax (863)773-0958
bcc@hardeecounty.net www.hardeecounty.net

March 24, 2004

Department of Environmental Protection
3804 Coconut Palm Drive
Tampa, FL 33619-8318

RE: Expansion of Hardee County Class I Landfill – Leachate Treatment Assurance

Dear Sir or Madam:

It has been estimated that the average generation of leachate requiring hauling and treatment will be approximately 25,000 gallons per day, and in the event of a major storm, the peak generation could reach as high as 113,000 gallons per day.

Hardee County currently has, and will continue, their local agreement with the City of Wauchula's Waste Water Treatment Plant for the treatment of leachate. This agreement is for the average treatment of 25,000 gallons per day, however; this amount has been adjusted on several occasions depending on the county's need to increase or decrease the amount.

Hardee County has a new Waste Water Treatment Plant located just north of Wauchula. This plant is currently in "Phase I" operation meaning that its current capacity is 120,000 gallons per day with a current estimated usage of 57,000 gallons per day, allowing an excess of 63,000 gallons per day potential usage for treatment of landfill leachate. (Final phase of this plant will increase the plants daily capacity to 360,000 gallons per day.) The County has made considerations in the process of planning the future expansion of this plant in regards to the landfill expansion and the treatment of landfill leachate.

The County also owns Vandolah Waste Water Treatment Plant that has a daily capacity of 50,000 gallons. The current usage of this plant is no greater than 25,000 gallons per day, leaving an excess of 25,000 gallons per day potential usage for treatment of landfill leachate. And finally, in emergency situations encountered in the past, we have received assistance from Manatee County's Wastewater Treatment Plant where they have, on one particular occasion, treated 1,000,000 gallons of excess leachate from our facility.

In summary, the peak generation of leachate could be covered as follows:

City of Wauchula	25,000 + gpd
Wauchula Hills Plant	63,000 + gpd
Vandolah Plant	25,000 gpd
Manatee County	contingency

Sincerely,

Lexton H. Albritton Jr.

Lexton H. Albritton, Jr.
County Manager

c: J.R. Prestridge, Public Works Director
Joe O'Neill, SCS Engineers
Janice Williamson, Solid Waste Director

Dep leachate 03-25-04 landfill

William R. Lambert, Jr. – Gordon R. Norris
Clifton N. Timmerman - Bobby Ray Smith - Walter B. Olliff, Jr.
County Manager Lexton H. Albritton, Jr. — County Attorney Ken Evers

"An Equal Opportunity Employer"

SCS ENGINEERS

CLIENT Hardee County	PROJECT ~~Landfill Expansion — RAI 1~~	JOB NO. 09199033.09	
SUBJECT Leachate Balance Summary		BY LEK	DATE 11/9/04
		CHECKED JHO	DATE 11/15/04

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

Objective:

1. Conduct a leachate balance accounting ~~for leachate from~~ the existing landfill footprint and various fill sequences of the expansion.
2. Utilize the HELP model data from various fill sequences to determine the maximum amount of acreage that can be open at one time.
3. Determine the amount of hauling trips required to empty the two leachate holding tanks.
4. If a peak storm event occurs over the weekend, how many trips are required to empty the holding tanks while complying with the agreements with area wastewater treatment plants (WWTPs).

Approach:

Since the open cell is approximately seven feet below grade, large amounts of leachate are captured within the cell and must be pumped to the leachate holding tanks until they can be hauled to a local wastewater treatment plant (WWTP). The County has three WWTPs that they can haul leachate to. The following table shows the maximum disposal quantities that the County has with area WWTPs. These quantities are the governing factor in the disposal of leachate.

WWTP	CAPACITY (gpd)	Haul Time (min)	One-Way Distance (miles)
City of Wauchula	25,000	70	3
Vandolah	25,000	100	9.5
Wauchula Hills	63,000	100	7.4

The following scenarios have been modeled to correspond with the fill sequencing of Phase II, Sections I and II:

1. Two acres open with no waste.
2. Two acres with 10 ft of waste within the cell.
3. Two acres with 10 ft of waste within the cell and 1 acre open with no waste.
4. Three acres with 40 ft of waste within the cell.
5. Three acres with 40 ft of waste within the cell and 1 acre open with no waste.
6. Four acres with 40 ft of waste within the cell and 1 acre open with no waste.
7. Five acres with 40 ft of waste within the cell.
8. Five acres with 40 ft of waste within the cell and 1 acre open with no waste.
9. Seven acres with 40 ft of waste within the cell and 1 acre open with no waste.

The filling scenarios assume a peak storm event occurred over the weekend, with subsequent average rain events on the days following the peak event. The filling scenarios examine the amount of time it takes to empty the two tanks after the peak storm event and with the daily, average events.

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION

NOV 1 0 2004

SOUTHWEST DISTRICT
TAMPA

SCS ENGINEERS		
	SHEET 2	of
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09
SUBJECT Leachate Balance Proposed System (Peak Leachate Generation Conditions)	BY LEK CHECKED JHO	DATE 1/14/2004 DATE 11/15/04

City of Wauchula WWTP

Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

City of Wauchula can accept 25,000 gpd (this equals 5 loads at 70 min/load), which is a 6 hour work day.

Vandolah WWTP

Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	30	min/load	per Hardee County 9.5 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	30	min/load	per Hardee County (9.5 mile trip, one way)
ΣTruck Time =	100	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	50.0	gpm	

Vandolah can accept 25.000 gpd (this equals 5 loads at 100 min/load), which is a 8.5 hour work day.

Wauchula Hills WWTP

Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	63,000	gpd	Max daily limit into WWTP (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	30	min/load	per Hardee County (7.4 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	30	min/load	per Hardee County (7.4 mile trip, one way)
ΣTruck Time =	100	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	50.0	gpm	

Wauchulah Hills can accept 63,000 gpd (this equals 13 loads at 100 min/load), which is a 11 hour work day for two tankers.

CONCLUSION:
During peak leachate conditions, 113,000 gpd can be disposed of at area WWTPs. Four-5000 gallon tankers will be needed to deliver the leachate, resulting in 23 loads per day.

SCS ENGINEERS SHEET of			
CLIENT Hardee County	PROJECT Landfill Expansion		JOB NO. 09199033.09
SUBJECT Leachate Balance Leachate Balance Summary	BY LEK		DATE 1/22/2004
	CHECKED HD		DATE

The goal of this exercise was to determine the amount of leachate that can be anticipated when the landfill cell is initially opened. A couple different scenarios were run:

- Existing Conditions
- Proposed Conditions w/ Average Rainfall
- Proposed Conditions w/ Peak Rainfall

Existing Conditions

The existing condition calculations show that the County currently hauls between 4 to 5 loads of leachate a day to the City of Wauchula WWTP; this hauling frequency reflects current leachate hauling operations on site. The calculations also show that the County has the flexibility to not haul leachate on the weekend (as indicated by the "63 hours, no Saturday" run) and still contain all the leachate within one tank.

Proposed Conditions w/ Average Rainfall

Since the open cell is approximately 7 feet below grade, large amounts of leachate are captured within the cell and must be pumped to the leachate holding tanks until they can be hauled to a local wastewater treatment plants (WWTP). The County has three WWTPs that they can haul leachate to:

WWTP	CAPACITY (gpd)	Haul Time (min)	One-Way Distance (miles)
City of Wauchula	25,000	70	3
Vandolah	25,000	100	9.5
Wauchula Hills	63,000	100	7.4

The average rainfall represents a typical afternoon storm that the landfill can anticipate. With 2 acres open, the County can continue to haul 4 loads of leachate per day to the City of Wauchula WWTP. This scenario also shows that the County still has the flexibility to not haul leachate over the weekend. To compensate for not hauling over the weekend, the County, as well as independent haulers, must haul loads of leachate to the three WWTPs.

Proposed Conditions w/ Peak Rainfall

The peak rainfall event represents the 25 year-24 hour storm event. The storm occurs in 24 hours, but it takes approximately 48 hours to empty the open cell. With 2 acres open, the County, as well as independent haulers, must be hauling leachate as soon as the storm begins. The County and independent haulers must haul the maximum amount of leachate that is accepted to the WWTPs each day in order to not overflow the two tanks. During the 48 hours it takes to pump the cell dry, one storage tank is completely full and the other tank has approximately 24,000 gallons.

SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Leachate Balance	LEK	1/22/2004
Leachate Balance Summary	CHECKED JH	DATE

Existing Conditions

	City of Wauchula	Vandolah	Wauchula Hills	Tanker Volume (gal)
	Loads	Loads	Loads	
24 hour	4	--	--	5,000
63 hour, no Saturday[1]	--	--	--	5,000
Monday	5	--	--	5,000
Tuesday	5	--	--	5,000
Wednesday	5	--	--	5,000
Thursday	4	--	--	5,000
Friday	4	--	--	5,000
63 hour, no Saturday[2]	4	--	--	5,000
Monday	5	--	--	5,000
Tuesday	4	--	--	5,000
Wednesday	4	--	--	5,000
Thursday	4	--	--	5,000
Friday	4	--	--	5,000

Proposed Conditions (Average Flow)

2 Acres Open	City of Wauchula	Vandolah	Wauchula Hills	Tanker Volume (gal)	Volume in Tank (gal)	
	Loads	Loads	Loads			
24 hour	4	--	--	5,000	0	
63 hour, no Saturday[1]	--	--	--	5,000	43,116	Leachate Contained
Monday	5	5	2	5,000	0	
Tuesday	4	--	--	5,000	0	
Wednesday	4	--	--	5,000	0	
Thursday	4	--	--	5,000	0	
Friday	4	--	--	5,000	0	
63 hour, w/ Saturday[2]	4	--	--	5,000	23,116	Leachate Contained
Monday	5	3	--	5,000	0	
Tuesday	4	--	--	5,000	0	
Wednesday	4	--	--	5,000	0	
Thursday	4	--	--	5,000	0	
Friday	4	--	--	5,000	0	

Proposed Conditions (Peak Flow)

2 Acres Open	City of Wauchula	Vandolah	Wauchula Hills	Tanker Volume (gal)	Tank Volume (gal)	
	Loads	Loads	Loads			
48 hr peak rainfall[3]	10	10	25.2	5,000	100,062	Leachate Contained
Monday	5	5	12.6	5,000	30,178	Leachate Contained
Tuesday	5	5	--	5,000	0	Leachate Contained
Wednesday	4	--	--	5,000	0	Leachate Contained
Thursday	4	--	--	5,000	0	Leachate Contained
Friday	4	--	--	5,000	0	Leachate Contained

1. This scenario represents a typical weekend w/out hauling.
   63 hours = time span from Friday @ 5 pm to Monday @ 8 am
2. This scenario represents a typical weekend w/ hauling.
3. Represents the 25 year-24 hour storm event with an open cell. The storm occurs in 24 hours, but it takes 48 hours to completely empty the open cell. If the County and independent contractors haul the maximum amount allowable to the WWTP, the tanks will not overflow. Note that with this scenario one tank is full and the other tank has approximately 24,000 gallons of leachate in it.

Independent contractor is hauling leachate

f:/project/hardee/09199033.09/leachbalancesummary.xls/Summary

SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Leachate Balance	LEK	1/14/2004
Proposed System (Average Leachate Generation Conditions)	CHECKED JHB	DATE

City of Wauchula WWTP

Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

City of Wauchula can accept 25,000 gpd (this equals 5 loads at 70 min/load), which is a 6 hour work day.

Vandolah WWTP

Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	30	min/load	per Hardee County 9.5 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	30	min/load	per Hardee County (9.5 mile trip, one way)
ΣTruck Time =	100	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	50.0	gpm	

Vandolah can accept 25,000 gpd (this equals 5 loads at 100 min/load), which is a 8.5 hour work day.

Wauchula Hills WWTP

Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	63,000	gpd	Max daily limit into WWTP (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	30	min/load	per Hardee County (7.4 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	30	min/load	per Hardee County (7.4 mile trip, one way)
ΣTruck Time =	100	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	50.0	gpm	

Wauchulah Hills can accept 63,000 gpd (this equals 13 loads at 100 min/load), which is a 11 hour work day for two tankers.

CONCLUSION:
During peak leachate conditions, 113,000 gpd can be desposed of at area WWTPs. Four-5000 gallon tankers will be needed to deliver the leachate, resulting in 23 loads per day.

Leachate Balance
Existing Conditions

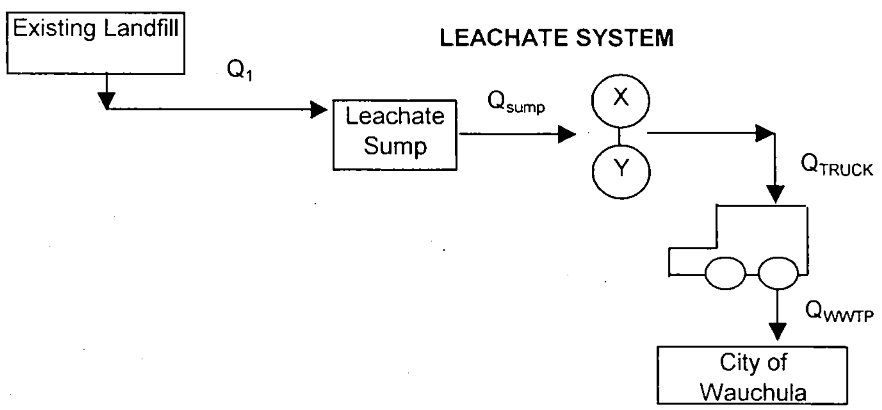
SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Leachate Balance	LEK	1/14/2004
Existing System	CHECKED	DATE

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

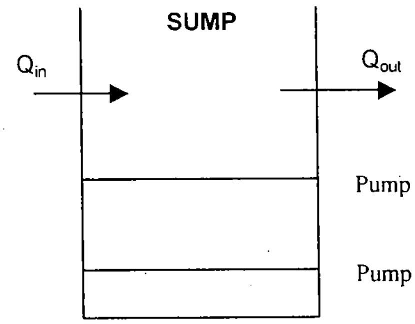
Q_l =	4,836,780	gal/yr	=	13,251	gal/day	(2003 Leachate Quantity, Attachment 1)
Q_{sump} =	150	gpm				Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm				Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm				Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd				Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal				Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal				Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load				per Hardee County
Haul Time =	15	min/load				per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load				per Hardee County
Haul Time =	15	min/load				per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load				
V_{TRUCK} =	5,000	gal/load				
Q_{truck} =	71.4	gpm				

SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Leachate Balance Existing System	LEK	1/14/2004
	CHECKED JHO	DATE



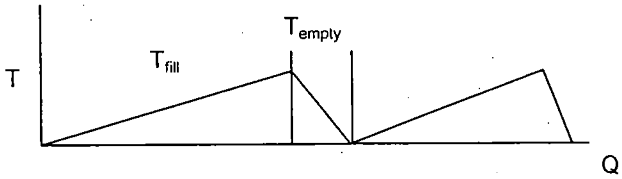
Pump On Elevation = 72

Pump Off Elevation = 71

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

$Q_{in} = Q_l =$ 13,251 gal/day = 9.2 gpm
$Q_{out} =$ 150 gpm

Time to Fill Sump = 40.9 min
Time to Empty Sump = 2.7 min



Time Span = 24 hours

Cycles per Time Span = 33 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 400.6 gal
Every 43.6 minutes, the tank is filling at 150 gpm for 2.7 minutes, which equals 400.6 gallons.

$Q_{out\text{-}tank}$

Hauling Frequency = 4 loads per time span (volume of tanker)
$V_{TRUCK} =$ 5,000 gal/load

Net Discharge into the tank(s)

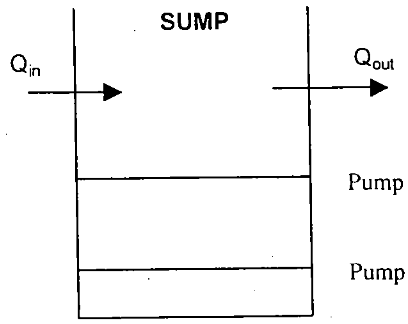
$\Sigma Q_{in\text{-}tank} =$ 13,251 gal per time span
$\Sigma Q_{out\text{-}tank} =$ 20,000 gal per time span ACCEPTED AT WWTP
$V_{tank} =$ -6,749 gal

SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Leachate Balance	LEK	1/14/2004
Existing System	CHECKED JHO	DATE



Pump On Elevation = 72

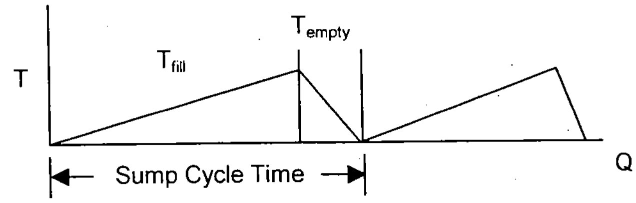
Pump Off Elevation = 71

Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

$Q_{in} = Q_1 =$ 13,251 gal/day = 9.2 gpm

$Q_{out} =$ 150 gpm

Time to Fill Sump =	40.9	min
Time to Empty Sump =	2.7	min
Sump Cycle Time =	43.5	min



Time Span = 63 hours

Cycles per Time Span = 87 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 400.6 gal

Every 43.6 minutes, the tank is filling at 150 gpm for 2.7 minutes, which equals 400.6 gallons.

$Q_{out\text{-}tank}$

Hauling Frequency = 0 loads per time span (volume of tanker)

$V_{TRUCK} =$ 5,000 gal/load

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$ 34,785 gal per time span

$\Sigma Q_{out\text{-}tank} =$ 0 gal per time span ACCEPTED AT WWTP

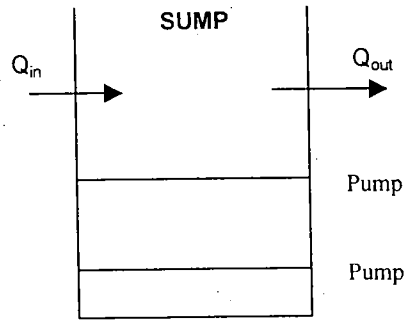
$V_{tank} =$ 34,785 gal

SCS ENGINEERS

SHEET .. of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Leachate Balance	LEK	1/14/2004
Existing System	CHECKED JHo	DATE



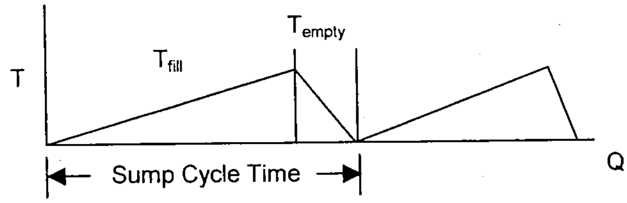
Pump On Elevation = 72

Pump Off Elevation = 71

Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

$Q_{in} = Q_l =$	13,251	gal/day =	9.2	gpm
$Q_{out} =$	150	gpm		

Time to Fill Sump =	40.9	min
Time to Empty Sump =	2.7	min
Sump Cycle Time =	43.5	min
Time Span =	**24**	**hours**



Cycles per Time Span = 33 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 400.6 gal

Every 43.6 minutes, the tank is filling at 150 gpm for 2.7 minutes, which equals 400.6 gallons.

$Q_{out\text{-}tank}$

Hauling Frequency =	5	loads per time span (volume of tanker)
$V_{TRUCK} =$	5,000	gal/load

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$	48,037	gal per time span	
$\Sigma Q_{out\text{-}tank} =$	25,000	gal per time span	ACCEPTED AT WWTP
$V_{tank} =$	23,037	gal	

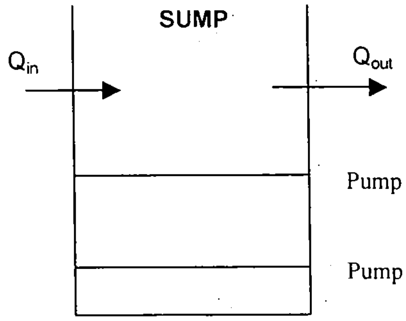
f://project/hardee/09199033.09/help/existleachatebalance.xls/mon (no sat)

SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Leachate Balance	LEK	1/14/2004
Existing System	CHECKED JH	DATE



Pump On Elevation = 72

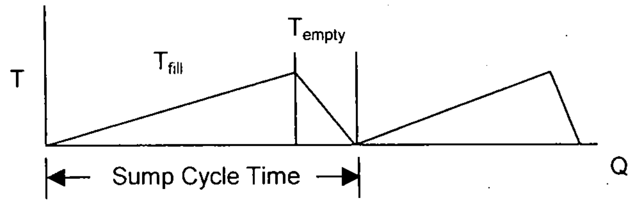
Pump Off Elevation = 71

Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

$Q_{in} = Q_1 =$ 13,251 gal/day = 9.2 gpm

$Q_{out} =$ 150 gpm

Time to Fill Sump =	40.9	min
Time to Empty Sump =	2.7	min
Sump Cycle Time =	43.5	min
Time Span =	**24**	**hours**



Cycles per Time Span = 33 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 400.6 gal

Every 43.6 minutes, the tank is filling at 150 gpm for 2.7 minutes, which equals 400.6 gallons.

$Q_{out\text{-}tank}$

Hauling Frequency = 5 loads per time span (volume of tanker)

$V_{TRUCK} =$ 5,000 gal/load

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$ 36,288 gal per time span

$\Sigma Q_{out\text{-}tank} =$ 25,000 gal per time span ACCEPTED AT WWTP

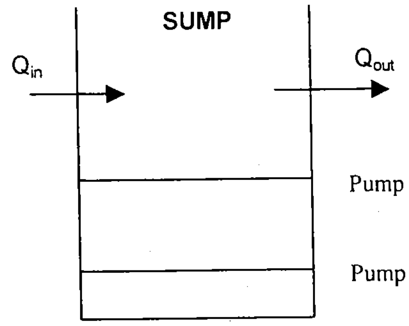
$V_{tank} =$ 11,288 gal

SCS ENGINEERS

SHEET . of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Leachate Balance Existing System	LEK	1/14/2004
	CHECKED	DATE
	JHO	



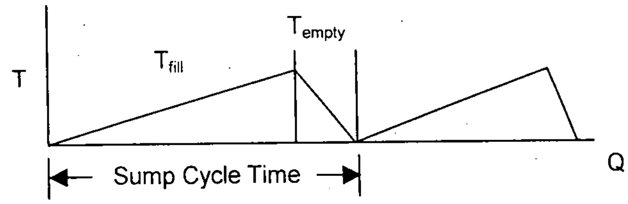
Pump On Elevation = 72

Pump Off Elevation = 71

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

$Q_{in} = Q_t =$ 13,251 gal/day = 9.2 gpm
$Q_{out} =$ 150 gpm

Time to Fill Sump = 40.9 min
Time to Empty Sump = 2.7 min
Sump Cycle Time = 43.5 min



Time Span = 24 hours

Cycles per Time Span = 33 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 400.6 gal

Every 43.6 minutes, the tank is filling at 150 gpm for 2.7 minutes, which equals 400.6 gallons.

$Q_{out\text{-}tank}$

Hauling Frequency = 5 loads per time span (volume of tanker)
$V_{TRUCK} =$ 5,000 gal/load

Net Discharge into the tank(s)

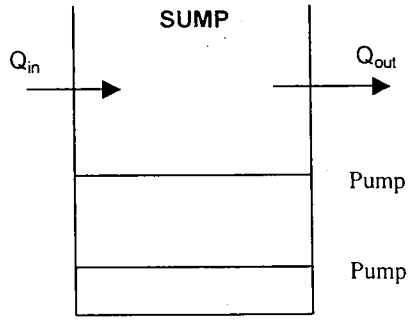
$\Sigma Q_{in\text{-}tank} =$ 24,539 gal per time span
$\Sigma Q_{out\text{-}tank} =$ 25,000 gal per time span ACCEPTED AT WWTP
$V_{tank} =$ -461 gal

SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Leachate Balance Existing System	LEK	1/14/2004
	CHECKED JHD	DATE



Pump On Elevation = 72

Pump Off Elevation = 71

Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

$Q_{in} = Q_1 =$ 13,251 gal/day = 9.2 gpm

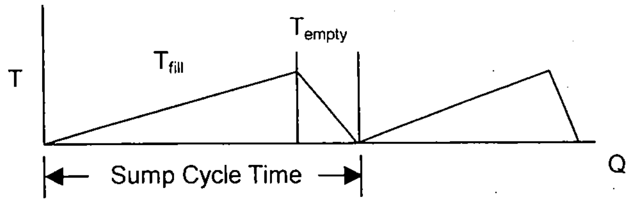
$Q_{out} =$ 150 gpm

Time to Fill Sump = 40.9 min

Time to Empty Sump = 2.7 min

Sump Cycle Time = 43.5 min

Time Span = 63 hours



Cycles per Time Span = 87 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 400.6 gal

Every 43.6 minutes, the tank is filling at 150 gpm for 2.7 minutes, which equals 400.6 gallons.

$Q_{out\text{-}tank}$

Hauling Frequency = 4 loads per time span (volume of tanker)

$V_{TRUCK} =$ 5,000 gal/load

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$ 34,785 gal per time span

$\Sigma Q_{out\text{-}tank} =$ 20,000 gal per time span ACCEPTED AT WWTP

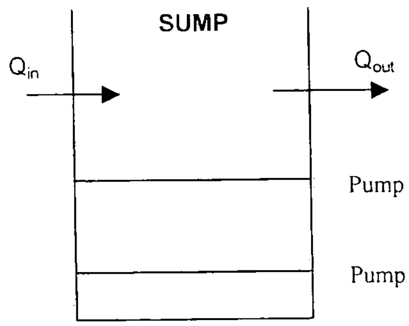
$V_{tank} =$ 14,785 gal

SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Leachate Balance	LEK	1/14/2004
Existing System	CHECKED: JHD	DATE



Pump On Elevation = 72

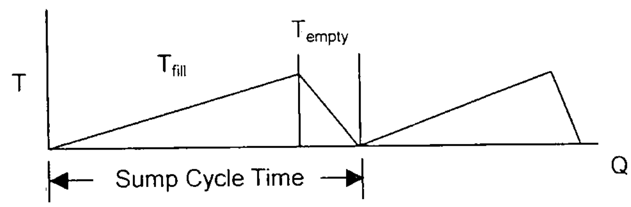
Pump Off Elevation = 71

Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

$Q_{in} = Q_1 =$ 13,251 gal/day = 9.2 gpm

$Q_{out} =$ 150 gpm

Time to Fill Sump =	40.9	min
Time to Empty Sump =	2.7	min
Sump Cycle Time =	43.5	min
Time Span =	**24**	**hours**



Cycles per Time Span = 33 times pumps will discharge into the tank per time span

$Q_{in-tank}$

$Q_{in-tank} =$ 400.6 gal

Every 43.6 minutes, the tank is filling at 150 gpm for 2.7 minutes, which equals 400.6 gallons.

$Q_{out-tank}$

Hauling Frequency = 5 loads per time span (volume of tanker)

$V_{TRUCK} =$ 5,000 gal/load

Net Discharge into the tank(s)

$\Sigma Q_{in-tank} =$ 28,037 gal per time span

$\Sigma Q_{out-tank} =$ 25,000 gal per time span ACCEPTED AT WWTP

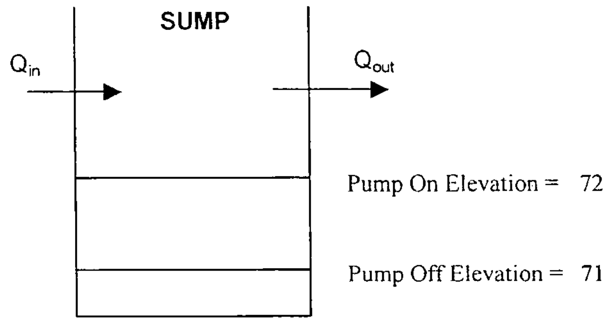
$V_{tank} =$ 3,037 gal

SCS ENGINEERS

SHEET ` of ·

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

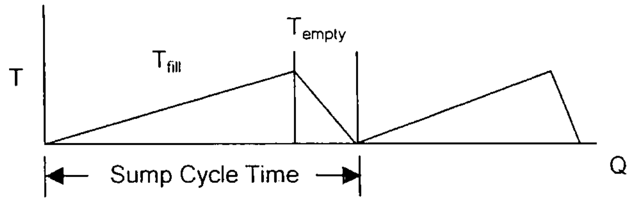
SUBJECT	BY	DATE
Leachate Balance Existing System	LEK	1/14/2004
	CHECKED	DATE
	\\th	



Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

$Q_{in} = Q_1 =$ 13,251 gal/day = 9.2 gpm
$Q_{out} =$ 150 gpm

Time to Fill Sump = 40.9 min
Time to Empty Sump = 2.7 min
Sump Cycle Time = 43.5 min



Time Span = 24 hours

Cycles per Time Span = 33 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 400.6 gal

Every 43.6 minutes, the tank is filling at 150 gpm for 2.7 minutes, which equals 400.6 gallons.

$Q_{out\text{-}tank}$

Hauling Frequency = 4 loads per time span (volume of tanker)

$V_{TRUCK} =$ 5,000 gal/load

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$ 16,288 gal per time span

$\Sigma Q_{out\text{-}tank} =$ 20,000 gal per time span ACCEPTED AT WWTP

$V_{tank} =$ -3,712 gal

Leachate Balance
Proposed System
(Average Leachate Generation Conditions)

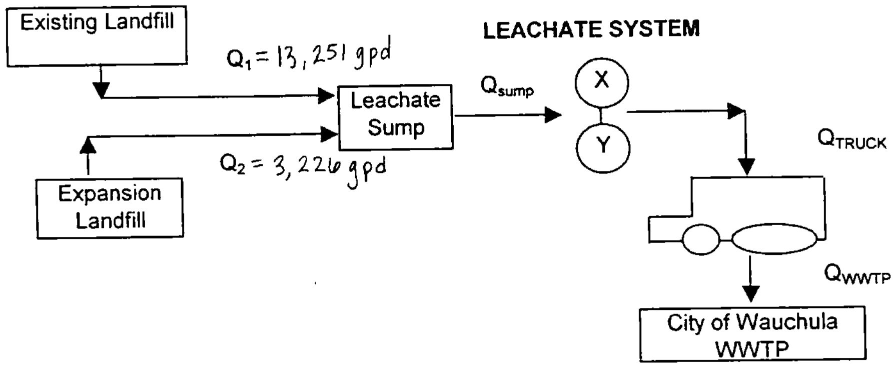
SCS ENGINEERS

SHEET 1 of 4

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT		
Leachate Balance Proposed System (Average Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004
	CHECKED JHO	DATE 11/15/04

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell =	2	acres							
Open Cell_{10ft} =	0	acres							
Open Cell_{40ft} =	0	acres							
Q_1^{*} =	4,836,780	gal/yr =	13,251	gal/day					
	Collection System		Detection System						
$Q_{2\text{-Open}}^{**}$ =	77,435	ft^3/yr-acre =	1,264	ft^3/yr-acre =	1,613	gpd/acre =	3,226	gal/day	
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft^3/yr-acre =	1,504	ft^3/yr-acre =	1,536	gpd/acre =	0	gal/day	
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft^3/yr-acre =	4,958	ft^3/yr-acre =	1,443	gpd/acre =	0	gal/day	
ΣQ_2^{***} =					4,591	gpd/acre =	3,226	gal/day	

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

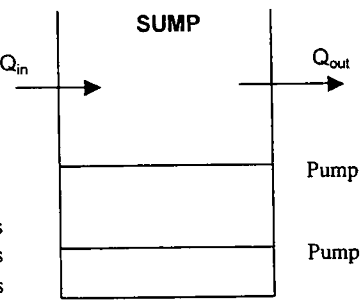
f://project/hardee/09199033.09/SWpermit/RAINo1/HELP/2acres_open/proposed (avg)

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT		
Leachate Balance Proposed System (Average Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004
	CHECKED JHO	DATE 11/15/04

16,477 gpd = Q_{in}



Pump On Elevation = 72

Pump Off Elevation = 71

Open Cell =	2	acres
Open Cell$_{10ft}$ =	0	acres
Open Cell$_{40ft}$ =	0	acres

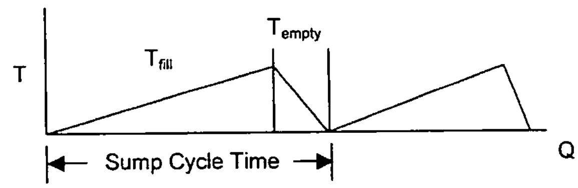
Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

13,251 + 3,226 gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2 =$ 16,477 gal/day = 11.4 gpm

$Q_{out} =$ 150 gpm

Time to Fill Sump =	32.9	min $= V/Q_{in}$
Time to Empty Sump =	+ 2.7	min $= V/Q_{out} - Q_{in}$
Sump Cycle Time =	35.6	min



Time Span = **63** **hours**

REPRESENTS A WEEKEND WITHOUT HAULING!

Cycles per Time Span = 106 times pumps will discharge into the tank per time span

↳ 63 hrs / 35.6 min $\frac{hr}{60 min}$

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 407.0 gal $= Q_{out} \times 2.7$ min

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	0
Vandolah	5000	0
Wauchula Hills*	5000	0

No Hauling

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$	43,252	gal per time span
$\Sigma Q_{out\text{-}tank} =$	0	gal per time span
$V_{tank} =$	43,252	gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

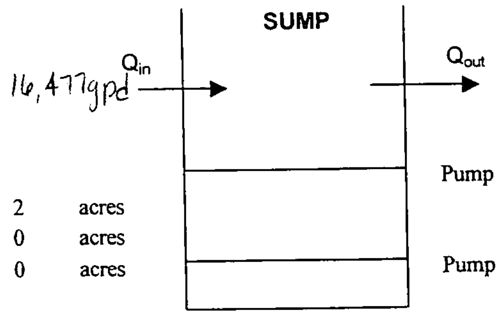
Average storm Event that occurs over the weekend. The County is NOT hauling; therefore, leachate accumulates in the tanks.

SCS ENGINEERS

SHEET 3 of 4

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT		
Leachate Balance	BY: LEK	DATE: 1/14/2004
	REVISED: LEK	11/9/2004
Proposed System (Average Leachate Generation Conditions)	CHECKED JHO	DATE 11/15/04



Pump On Elevation = 72

Pump Off Elevation = 71

Open Cell =	2	acres
Open Cell$_{10ft}$ =	0	acres
Open Cell$_{40ft}$ =	0	acres

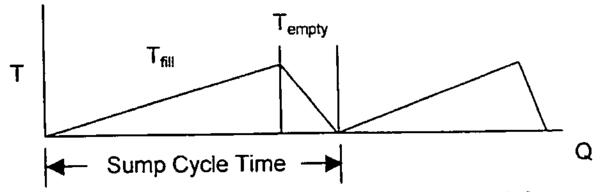
Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

13,251 + 3,226 gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2 =$ 16,477 gal/day = 11.4 gpm

$Q_{out} =$ 150 gpm

Time to Fill Sump =	32.9	min
Time to Empty Sump =	2.7	min
Sump Cycle Time =	35.6	min



Time Span = 24 **hours**
Represents the Monday following the weekend when leachate was not hauled.

Cycles per Time Span = 40 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 407.0 gal

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	5
Vandolah	5000	5
Wauchula Hills*	5000	2

Hauling Implemented

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$	59,729	gal per time span	
$\Sigma Q_{out\text{-}tank} =$	60,000	gal per time span	
$V_{tank} =$	-271	gal	(V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal

Average Storm event that occurs on the Monday that follows a weekend with NO hauling and the same storm event.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

NOV 19 2004

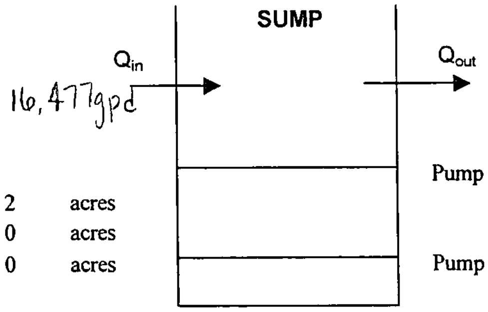
SOUTHWEST DISTRICT TAMPA

SCS ENGINEERS

SHEET 4 of 4

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT		
Leachate Balance Proposed System (Average Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004
	CHECKED JHO	DATE 11/15/04



Pump On Elevation = 72

Pump Off Elevation = 71

Open Cell =	2	acres
Open $Cell_{10ft}$ =	0	acres
Open $Cell_{40ft}$ =	0	acres

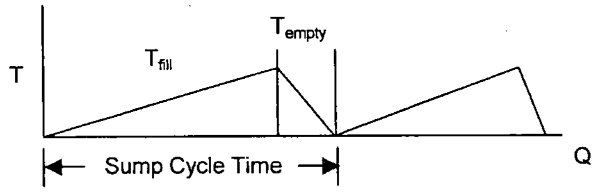
Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

13,251 + 3,226 gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2 =$ 16,477 gal/day = 11.4 gpm

$Q_{out} =$ 150 gpm

Time to Fill Sump =	32.9	min
Time to Empty Sump =	2.7	min
Sump Cycle Time =	35.6	min



Time Span = **63** **hours**

Represents a weekend with hauling on Saturday.

Cycles per Time Span = 106 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 407.0 gal

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	5
Vandolah	5000	4
Wauchula Hills*	5000	0

Loads hauled during the storm

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
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SOUTHWEST DISTRICT
TAMPA

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$ 43,252 gal per time span

$\Sigma Q_{out\text{-}tank} =$ 45,000 gal per time span

$V_{tank} =$ -1,748 gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal

Average storm event that occurs over the weekend. The County hauls one day; therefore, a minimal amount of leachate accumulates in the tanks.

f://project/hardee/09199033.09/SWpermit/RAINo1/HELP/2acres_open/63 hr (sat)

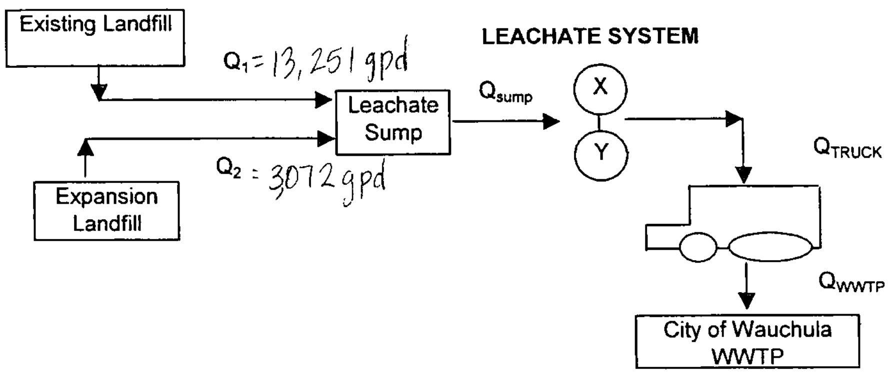
[redacted]

AVERAGE LEACHATE GENERATION CONDITIONS

(TWO ACRES AT a 10 FOOT WASTE LIFT)

SCS ENGINEERS			
		SHEET 1	of 4
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Leachate Balance Proposed System (Average Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004	
	CHECKED JHO	DATE 11/15/04	

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell =	0	acres							
Open $Cell_{10ft}$ =	2	acres							
Open $Cell_{40ft}$ =	0	acres							
Q_1^* =	4,836,780	gal/yr	=	13,251	gal/day				
	Collection System		Detection System						
$Q_{2\text{-Open}}^{**}$ =	77,435	ft³/yr-acre =	1,264	ft³/yr-acre =	1,613	gpd/acre =	0	gal/day	
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft³/yr-acre =	1,504	ft³/yr-acre =	1,536	gpd/acre =	3,072	gal/day	
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft³/yr-acre =	4,958	ft³/yr-acre =	1,443	gpd/acre =	0	gal/day	
ΣQ_2^{***} =					4,591	gpd/acre =	3,072	gal/day	

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

* 2003 Leachate Quantity (Attachment 1)

** Primary/Secondary System, HELP Model (Attachment 2)

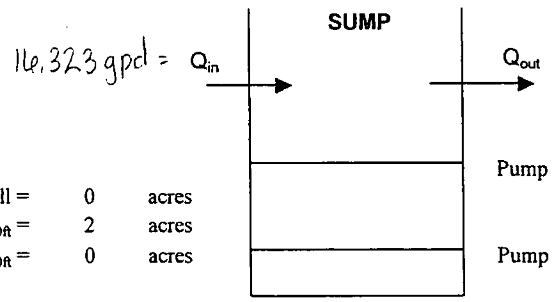
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

f://project/hardee/09199033.09/SWpermit/RAINo1/HELP/2acres_10ft/proposed (avg)

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK	DATE: 1/14/2004
Leachate Balance	REVISED: LEK	11/9/2004
Proposed System (Average Leachate Generation Conditions)	CHECKED JHO	DATE 11/15/04



Pump On Elevation = 72

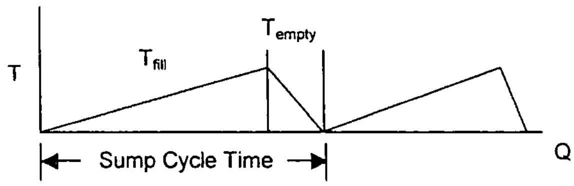
Pump Off Elevation = 71

Open Cell = 0 acres
Open $Cell_{10ft}$ = 2 acres
Open $Cell_{40ft}$ = 0 acres

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

$Q_{in} = Q_1 + \Sigma Q_2$ = 16,323 gal/day = 11.3 gpm — 13,251 + 3,072 gpd from Sheet 1
Q_{out} = 150 gpm

Time to Fill Sump = 33.2 min $= \forall / Q_{in}$
Time to Empty Sump = + 2.7 min $= \forall / (Q_{out} - Q_{in})$
Sump Cycle Time = 35.9 min



Time Span = 63 hours
REPRESENTS A WEEKEND WITHOUT HAULING!

Cycles per Time Span = 105 times pumps will discharge into the tank per time span
$\to$ 63 hrs / 35.9 min $\cdot \frac{hr}{60 min}$

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank}$ = 406.7 gal $= Q_{out} \times 2.7$ min

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	0
Vandolah	5000	0
Wauchula Hills*	5000	0

No Hauling

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank}$ = 42,849 gal per time span
$\Sigma Q_{out\text{-}tank}$ = 0 gal per time span
V_{tank} = 42,849 gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal

Average storm event that occurs over the weekend. The County is NOT hauling; therefore, leachate accumulates in the tanks.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

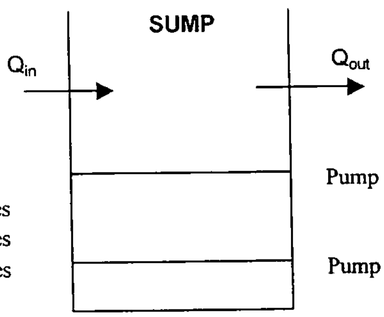
SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT		
Leachate Balance Proposed System (Average Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004
	CHECKED JAO	DATE 11/15/04

16,323gpd



Pump On Elevation = 72

Pump Off Elevation = 71

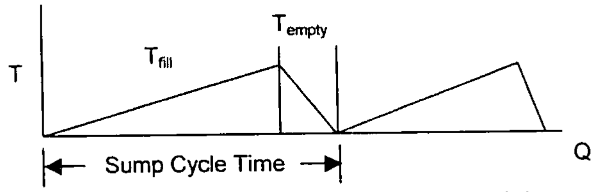
Open Cell = 0 acres
Open Cell$_{10ft}$ = 2 acres
Open Cell$_{40ft}$ = 0 acres

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 + 3,072 gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2 =$ 16,323 gal/day = 11.3 gpm
$Q_{out} =$ 150 gpm

Time to Fill Sump = 33.2 min
Time to Empty Sump = 2.7 min
Sump Cycle Time = 35.9 min



Time Span = 24 **hours**
Represents the Monday following the weekend when leachate was not hauled.

Cycles per Time Span = 40 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 406.7 gal

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	5
Vandolah	5000	5
Wauchula Hills*	5000	2

Hauling Implemented

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$ 59,172 gal per time span
$\Sigma Q_{out\text{-}tank} =$ 60,000 gal per time span
$V_{tank} =$ -828 gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal

Average storm event that occurs on the Monday that follows a weekend with NO hauling and the same storm event.

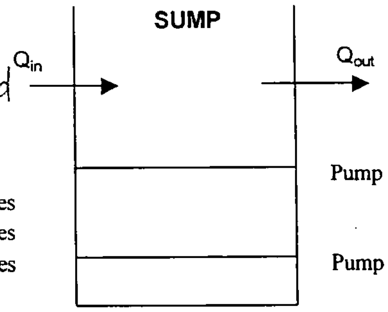
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

f://project/hardee/09199033.09/SWpermit/RAINo1/HELP/2acres_10ft/mon (no sat)

SCS ENGINEERS

CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09
SUBJECT Leachate Balance Proposed System (Average Leachate Generation Conditions)	BY: LEK REVISED: LEK CHECKED JHO	DATE: 1/14/2004 11/9/2004 DATE 11/15/04

16,323 gpd



Pump On Elevation = 72

Pump Off Elevation = 71

Open Cell =	0	acres
Open $Cell_{10ft}$ =	2	acres
Open $Cell_{40ft}$ =	0	acres

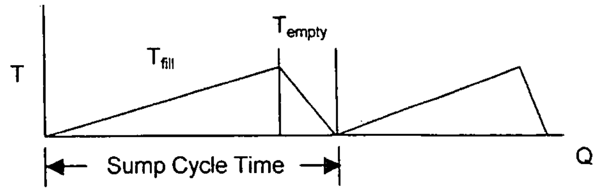
Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

13,251 + 3,072 gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2 =$ 16,323 gal/day = 11.3 gpm

$Q_{out} =$ 150 gpm

Time to Fill Sump =	33.2	min
Time to Empty Sump =	2.7	min
Sump Cycle Time =	35.9	min



Time Span = **63** **hours**

Represents a weekend with hauling on Saturday.

Cycles per Time Span = 105 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 406.7 gal

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)	
City of Wauchula	5000	5	Loads hauled during the storm event.
Vandolah	5000	4	
Wauchula Hills*	5000	0	

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank}$ =	42,849	gal per time span
$\Sigma Q_{out\text{-}tank}$ =	45,000	gal per time span
V_{tank} =	-2,151	gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal.

Average storm event that occurs over the weekend. The County hauls one day; therefore, a minimal amount of leachate accumulates in the tanks.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT

f://project/hardee/09199033.09/SWpermit/RAINo1/HELP/2acres_10ft/63 hr (sat)

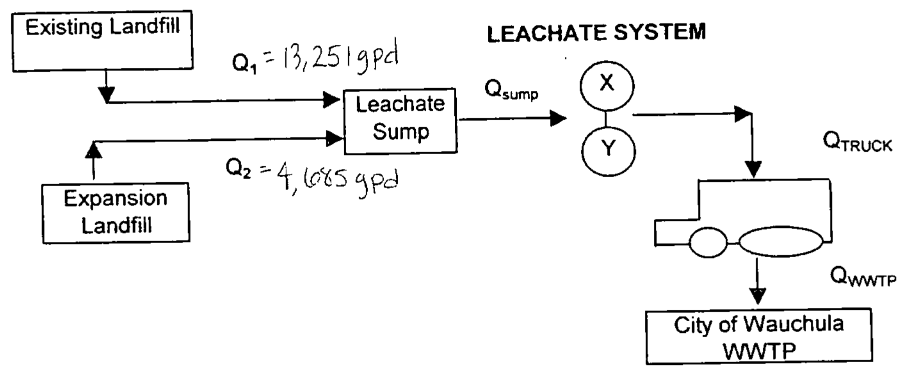
[redacted]

AVERAGE LEACHATE GENERATION CONDITIONS

(TWO ACRES AT a 10 FOOT WASTE LIFT & TWO ACRES OPEN)

SCS ENGINEERS			
	SHEET 1 of 4		
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Leachate Balance Proposed System (Average Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004	
	CHECKED JHC	DATE 11/15/04	

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell =	1	acres							
Open Cell_{10ft} =	2	acres							
Open Cell_{40ft} =	0	acres							
Q_1^{*} =	4,836,780	gal/yr =	13,251	gal/day					
	Collection System		Detection System						
$Q_{2\text{-Open}}^{**}$ =	77,435	ft³/yr-acre =	1,264	ft³/yr-acre =	1,613	gpd/acre =	1,613	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft³/yr-acre =	1,504	ft³/yr-acre =	1,536	gpd/acre =	3,072	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft³/yr-acre =	4,958	ft³/yr-acre =	1,443	gpd/acre =	0	gal/day
ΣQ_2^{***} =					4,591	gpd/acre =	4,685	gal/day

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

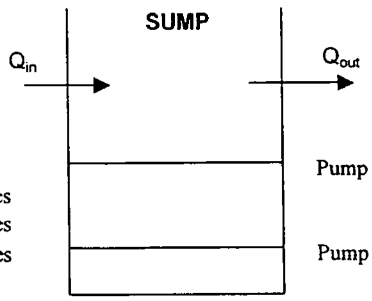
f://project/hardee/09199033.09/SWpermit/RAINo1/HELP/2acres_10ft-1acre_open/proposed (avg)

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK	DATE: 1/14/2004
Leachate Balance	REVISED: LEK	11/9/2004
Proposed System (Average Leachate Generation Conditions)	CHECKED JHO	DATE 11/15/04



Pump On Elevation = 72

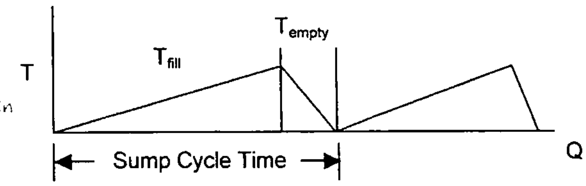
Pump Off Elevation = 71

Open Cell = 1 acres
$Open\ Cell_{10ft}$ = 2 acres
$Open\ Cell_{40ft}$ = 0 acres

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 + 4,685 gpd from sheet 1
$Q_{in} = Q_1 + \Sigma Q_2$ = 17,936 gal/day = 12.5 gpm
Q_{out} = 150 gpm

Time to Fill Sump = 30.2 min = $\forall / Q_{in}$
Time to Empty Sump = + 2.7 min = $\forall / Q_{out} - Q_{in}$
Sump Cycle Time = 32.9 min



Time Span = **63** **hours**
REPRESENTS A WEEKEND WITHOUT HAULING!

Cycles per Time Span = 115 times pumps will discharge into the tank per time span
63 hrs / 32.9 min $\frac{hr}{60\ min}$

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank}$ = 410.0 gal = $Q_{out} \times 2.7$ min

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	0
Vandolah	5000	0
Wauchula Hills*	5000	0

No Hauling

Net Discharge into the tank(s)

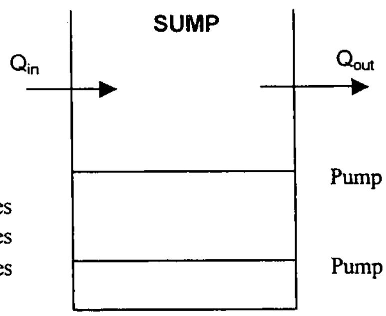
$\Sigma Q_{in\text{-}tank}$ = 47,082 gal per time span
$\Sigma Q_{out\text{-}tank}$ = 0 gal per time span
V_{tank} = 47,082 gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank vol = 158,000 gal.

Average storm event that occurs over the weekend.
The County is NOT hauling; therefore, leachate accumulates in the tank.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

SCS ENGINEERS SHEET 4 of 4			
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Leachate Balance Proposed System (Average Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004	
	CHECKED SHG	DATE 11/15/04	



Pump On Elevation = 72

Pump Off Elevation = 71

Open Cell =	1	acres
Open $Cell_{10ft}$ =	2	acres
Open $Cell_{40ft}$ =	0	acres

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)

Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 + 4,685 gpd from Sheet 1

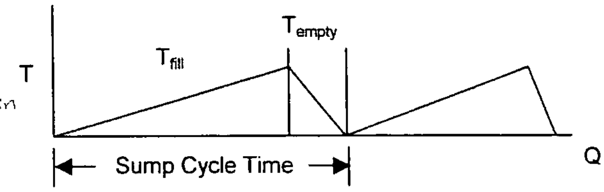
$Q_{in} = Q_1 + \Sigma Q_2 =$ 17,936 gal/day = 12.5 gpm

$Q_{out} =$ 150 gpm

Time to Fill Sump = 30.2 min = $\forall / Q_{in}$

Time to Empty Sump = + 2.7 min = $\forall / Q_{out} - Q_{in}$

Sump Cycle Time = 32.9 min



Time Span = 63 **hours**

Represents a weekend with hauling on Saturday.

Cycles per Time Span = 115 times pumps will discharge into the tank per time span

63 hrs / 32.9 min $\frac{hr}{60 min}$

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank}$ = 410.0 gal = $Q_{out} \times 2.7$ min.

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	5
Vandolah	5000	4
Wauchula Hills*	5000	0

Loads hauled during the storm event

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank}$ = 47,082 gal per time span

$\Sigma Q_{out\text{-}tank}$ = 45,000 gal per time span

V_{tank} = 2,082 gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal.

Average storm event that occurs over the weekend. The County hauls one day; therefore, a minimal amount of leachate accumulates in the tanks.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

[redacted]

AVERAGE LEACHATE GENERATION CONDITIONS

(THREE ACRES AT a 40 FOOT WASTE LIFT)

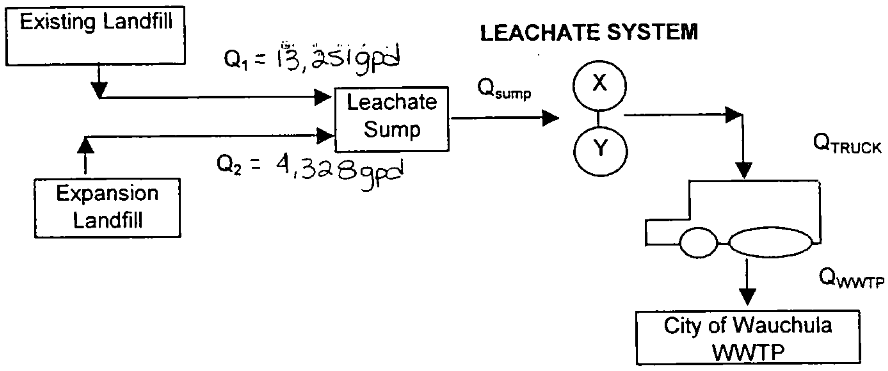
SCS ENGINEERS

SHEET 1 of 4

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK	DATE: 1/14/2004
Leachate Balance	REVISED: LEK	11/9/2004
Proposed System (Average Leachate Generation Conditions)	CHECKED SHO	DATE 11/19/04

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell =	0	acres							
Open Cell_{10ft} =	0	acres							
Open Cell_{40ft} =	3	acres							
Q_1^{*} =	4,836,780	gal/yr =	13,251	gal/day					
	Collection System		Detection System						
$Q_{2\text{-Open}}^{**}$ =	77,435	ft³/yr-acre =	1,264	ft³/yr-acre =	1,613	gpd/acre =	0	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft³/yr-acre =	1,504	ft³/yr-acre =	1,536	gpd/acre =	0	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft³/yr-acre =	4,958	ft³/yr-acre =	1,443	gpd/acre =	4,328	gal/day
ΣQ_2^{***} =					4,591	gpd/acre =	4,328	gal/day

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT TAMPA

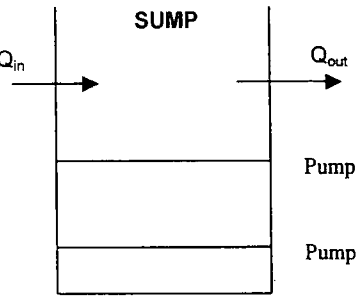
SCS ENGINEERS

SHEET 2 of 4

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK	DATE: 1/14/2004
Leachate Balance	REVISED: LEK	11/9/2004
Proposed System (Average Leachate Generation Conditions)	CHECKED JHO	DATE 11/15/04

17,579 gpd = Q_{in}



Pump On Elevation = 72

Pump Off Elevation = 71

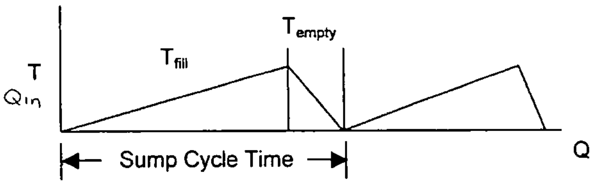
Open Cell = 0 acres
Open Cell_{10ft} = 0 acres
Open Cell_{40ft} = 3 acres

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
$\forall$ = Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

→ 13,251 + 4,328 gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2 =$ 17,579 gal/day = 12.2 gpm
$Q_{out} =$ 150 gpm

Time to Fill Sump = 30.8 min $= \forall / Q_{in}$
Time to Empty Sump = + 2.7 min $= \forall / (Q_{out} - Q_{in})$
Sump Cycle Time = 33.5 min



Time Span = **63** hours
REPRESENTS A WEEKEND WITHOUT HAULING!

Cycles per Time Span = 113 times pumps will discharge into the tank per time span
$= 63 \text{ hrs} / 33.5 \text{ min} \frac{\text{hr}}{60 \text{ min}}$

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 409.3 gal $= Q_{out} \times 2.7 \text{ min}$

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	0
Vandolah	5000	0
Wauchula Hills*	5000	0

NO Hauling

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$ 46,146 gal per time span
$\Sigma Q_{out\text{-}tank} =$ 0 gal per time span
$V_{tank} =$ 46,146 gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal

Average Storm Event that occurs over the weekend. The County is NOT hauling; therefore, leachate accumulates in the tanks.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

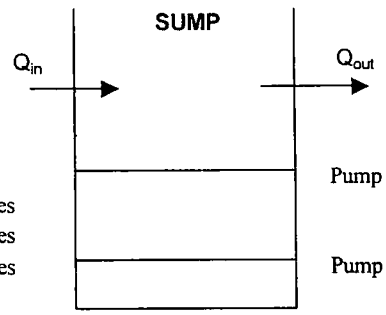
SCS ENGINEERS

SHEET 3 of 4

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK	DATE: 1/14/2004
Leachate Balance	REVISED: LEK	11/9/2004
Proposed System (Average Leachate Generation Conditions)	CHECKED JHO	DATE 11/15/04

17,579 gpd



Pump On Elevation = 72

Pump Off Elevation = 71

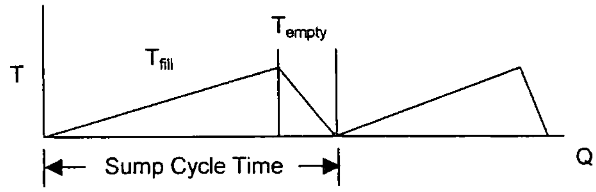
Open Cell =	0	acres
Open $Cell_{10ft}$ =	0	acres
Open $Cell_{40ft}$ =	3	acres

Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

13,251 + 4,328 from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2 =$ 17,579 gal/day = 12.2 gpm

$Q_{out} =$ 150 gpm



Time to Fill Sump =	30.8	min
Time to Empty Sump =	2.7	min
Sump Cycle Time =	33.5	min
Time Span =	**24**	**hours** Represents the Monday following the weekend when leachate was not hauled.
Cycles per Time Span =	43	times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 409.3 gal

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	5
Vandolah	5000	5
Wauchula Hills*	5000	3

Hauling Implemented

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$ 63,725 gal per time span

$\Sigma Q_{out\text{-}tank} =$ 65,000 gal per time span

$V_{tank} =$ -1,275 gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal

Average Storm event that occurs on the Monday that follows a weekend with NO hauling and the same storm event.

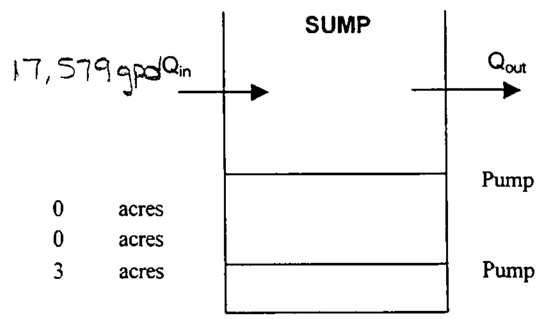
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

f://project/hardee/09199033.09/SWpermit/RAINo1/HELP/3acres_40ft/mon (no sat)

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK	DATE: 1/14/2004
Leachate Balance	REVISED: LEK	11/9/2004
Proposed System (Average Leachate Generation Conditions)	CHECKED SAO 11/15/04	DATE



Pump On Elevation = 72

Pump Off Elevation = 71

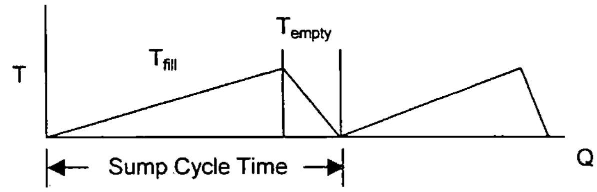
Open Cell = 0 acres
Open Cell$_{10ft}$ = 0 acres
Open Cell$_{40ft}$ = 3 acres

Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

13,251 + 4,328 from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2 =$ 17,579 gal/day = 12.2 gpm
$Q_{out} =$ 150 gpm

Time to Fill Sump = 30.8 min
Time to Empty Sump = 2.7 min
Sump Cycle Time = 33.5 min



Time Span = 63 hours
Represents a weekend with hauling on Saturday.

Cycles per Time Span = 113 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 409.3 gal

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	5
Vandolah	5000	4
Wauchula Hills*	5000	0

Loads Hauled during the Storm event

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$ 46,146 gal per time span
$\Sigma Q_{out\text{-}tank} =$ 45,000 gal per time span
$V_{tank} =$ 1,146 gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal

Average Storm Event that occurs over the weekend. The County hauls one day; therefore, a minimal amount of leachate accumulates in the tanks.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

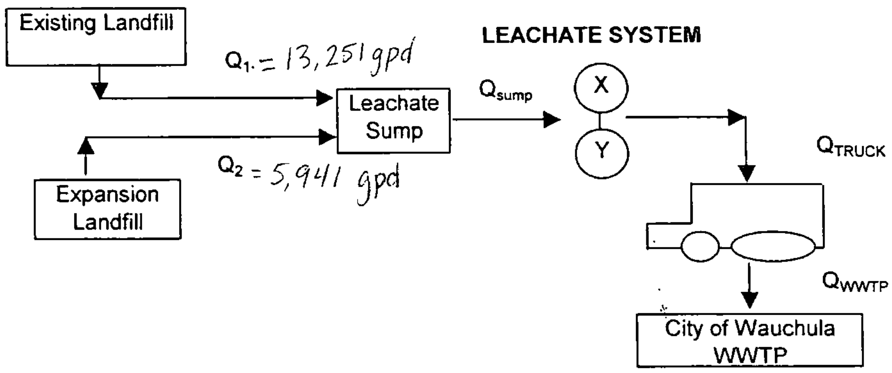
[redacted]

AVERAGE LEACHATE GENERATION CONDITIONS

(THREE ACRES AT a 40 FOOT WASTE LIFT& ONE ACRE OPEN)

SCS ENGINEERS		
	SHEET 1 of 4	
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09
SUBJECT Leachate Balance Proposed System (Average Leachate Generation Conditions)	BY: LEK REVISED: LEK CHECKED JHO	DATE: 1/14/2004 11/9/2004 DATE 11/15/04

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell =	1	acres							
Open Cell$_{10ft}$ =	0	acres							
Open Cell$_{40ft}$ =	3	acres							
Q_1^* =	4,836,780	gal/yr =	13,251	gal/day					
	Collection System		Detection System						
$Q_{2\text{-Open}}^{**}$ =	77,435	ft^3/yr-acre =	1,264	ft^3/yr-acre =	1,613	gpd/acre =	1,613	gal/day	
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft^3/yr-acre =	1,504	ft^3/yr-acre =	1,536	gpd/acre =	0	gal/day	
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft^3/yr-acre =	4,958	ft^3/yr-acre =	1,443	gpd/acre =	4,328	gal/day	
ΣQ_2^{***} =					4,591	gpd/acre =	5,941	gal/day	

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT TAMPA

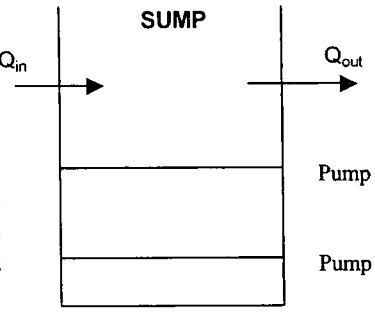
* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK	DATE: 1/14/2004
Leachate Balance	REVISED: LEK	11/9/2004
Proposed System (Average Leachate Generation Conditions)	CHECKED JHO	DATE 11/15/04

19,192 gpd = Q_{in}



Pump On Elevation = 72

Pump Off Elevation = 71

Open Cell =	1	acres
Open $Cell_{10ft}$ =	0	acres
Open $Cell_{40ft}$ =	3	acres

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)

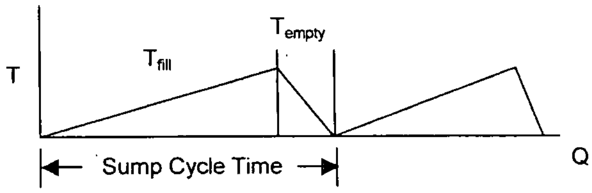
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 + 5,941 gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2$ = 19,192 gal/day = 13.3 gpm

Q_{out} = 150 gpm

Time to Fill Sump =	28.2	min
Time to Empty Sump =	2.8	min
Sump Cycle Time =	31.0	min



Time Span = 24 **hours**

Represents the Monday following the weekend when leachate was not hauled.

Cycles per Time Span = 47 times pumps will discharge into the tank per time span

$Q_{in-tank}$

$Q_{in-tank}$ = 412.7 gal

Every sump cycle time, the tank is filling at 150 gpm for ~~2.7~~ 2.8 minutes, which equals the flow into the tank.

$Q_{out-tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	5
Vandolah	5000	5
Wauchula Hills*	5000	4

Hauling Implemented

Net Discharge into the tank(s)

$\Sigma Q_{in-tank}$ = 69,572 gal per time span

$\Sigma Q_{out-tank}$ = 70,000 gal per time span

V_{tank} = -428 gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal

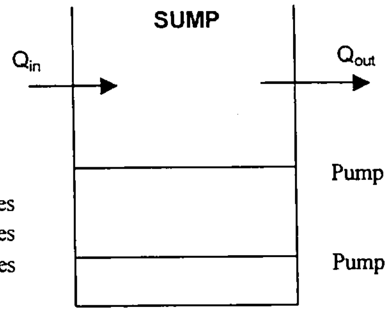
Average storm event that occurs on the Monday that follows a weekend with NO hauling and the same storm event.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT TAMPA

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK	DATE: 1/14/2004
Leachate Balance	REVISED: LEK	11/9/2004
Proposed System (Average Leachate Generation Conditions)	CHECKED SHO	DATE 11/15/04

19,192gpd =



Pump On Elevation = 72

Pump Off Elevation = 71

Open Cell =	1	acres
Open $Cell_{10ft}$ =	0	acres
Open $Cell_{40ft}$ =	3	acres

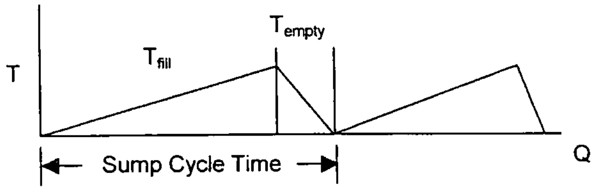
Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

13,251 + 5,941 gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2 =$ 19,192 gal/day = 13.3 gpm

$Q_{out} =$ 150 gpm

Time to Fill Sump =	28.2	min
Time to Empty Sump =	2.8	min
Sump Cycle Time =	31.0	min



Time Span = **63** **hours**
Represents a weekend with hauling on Saturday.

Cycles per Time Span = 122 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 412.7 gal

Every sump cycle time, the tank is filling at 150 gpm for 2.8 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	5
Vandolah	5000	5
Wauchula Hills*	5000	0

Loads Hauled during the Storm

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$	50,379	gal per time span	
$\Sigma Q_{out\text{-}tank} =$	50,000	gal per time span	
$V_{tank} =$	379	gal	(V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal

Average Storm event that occurs over the weekend. The County hauls one day, therefore, a minimal amount of leachate accumulates in the tanks.

[redacted]

AVERAGE LEACHATE GENERATION CONDITIONS

(FOUR ACRES AT a 40 FOOT WASTE LIFT & ONE ACRE OPEN)

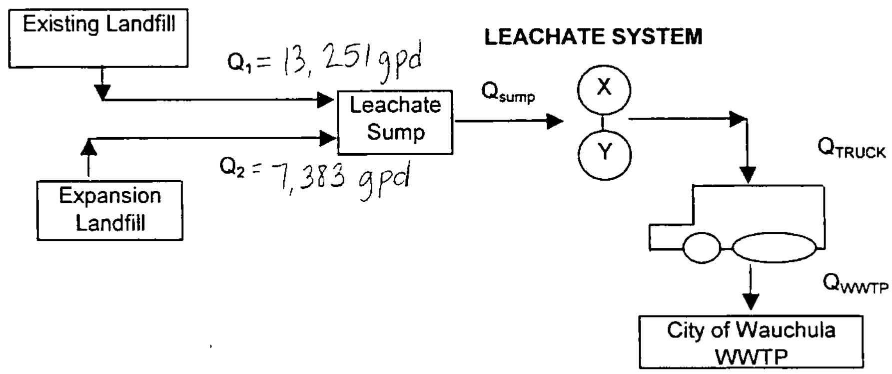
SCS ENGINEERS

SHEET 1 of 4

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004
Leachate Balance Proposed System (Average Leachate Generation Conditions)	CHECKED JHO	DATE 11/15/04

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell =	1	acres									
Open Cell_{10ft} =	0	acres									
Open Cell_{40ft} =	4	acres									
Q_1^{*} =	4,836,780	gal/yr	=	13,251	gal/day						
	Collection System			Detection System							
$Q_{2\text{-Open}}^{**}$ =	77,435	ft^3/yr-acre =		1,264	ft^3/yr-acre =	1,613	gpd/acre	=	1,613	gal/day	
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft^3/yr-acre =		1,504	ft^3/yr-acre =	1,536	gpd/acre	=	0	gal/day	
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft^3/yr-acre =		4,958	ft^3/yr-acre =	1,443	gpd/acre	=	5,771	gal/day	
ΣQ_2^{***} =						4,591	gpd/acre	=	7,383	gal/day	

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

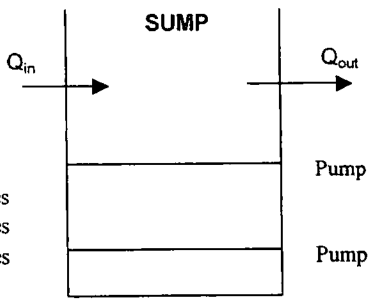
* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK	DATE: 1/14/2004
Leachate Balance	REVISED: LEK	11/9/2004
Proposed System (Average Leachate Generation Conditions)	CHECKED JHO	DATE 11/15/04



Pump On Elevation = 72

Open Cell = 1 acres
Open $Cell_{10ft}$ = 0 acres
Open $Cell_{40ft}$ = 4 acres

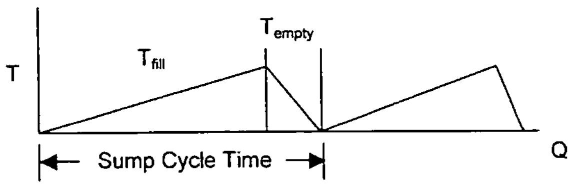
Pump Off Elevation = 71

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 + 7,383 gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2$ = 20,635 gal/day = 14.3 gpm
Q_{out} = 150 gpm

Time to Fill Sump = 26.2 min = V/Q_{in}
Time to Empty Sump = + 2.8 min = $V/(Q_{out} - Q_{in})$
Sump Cycle Time = 29.0 min



Time Span = 63 hours
REPRESENTS A WEEKEND WITHOUT HAULING!

Cycles per Time Span = 130 times pumps will discharge into the tank per time span

→ 63 hrs/29.0 min $\frac{hr}{60\ min}$

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank}$ = 415.7 gal = $Q_{out} \times 2.8$

Every sump cycle time, the tank is filling at 150 gpm for ~~2.7~~ 2.8 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	0
Vandolah	5000	0
Wauchula Hills*	5000	0

No Hauling

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank}$ = 54,166 gal per time span
$\Sigma Q_{out\text{-}tank}$ = 0 gal per time span
V_{tank} = 54,166 gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal

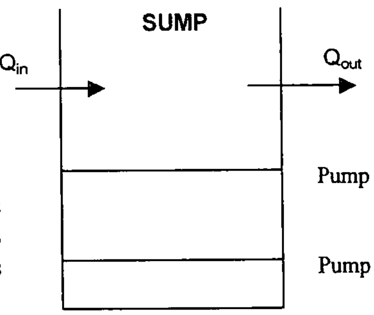
Average storm event that occurs over the weekend.
The County is NOT hauling; therefore, leachate accumulates in the tanks.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT TAMPA

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT		
Leachate Balance Proposed System (Average Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004
	CHECKED JHO	DATE 11/15/04



Pump On Elevation = 72

Pump Off Elevation = 71

Open Cell =	1	acres
Open Cell$_{10ft}$ =	0	acres
Open Cell$_{40ft}$ =	4	acres

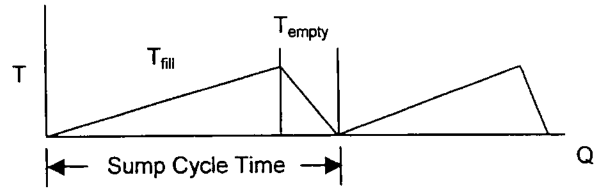
Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

13,251 + 7,383 gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2 =$ 20,635 gal/day = 14.3 gpm

$Q_{out} =$ 150 gpm

Time to Fill Sump =	26.2	min
Time to Empty Sump =	2.8	min
Sump Cycle Time =	29.0	min



Time Span = 24 **hours**
Represents the Monday following the weekend when leachate was not hauled.

Cycles per Time Span = 50 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 415.7 gal

Every sump cycle time, the tank is filling at 150 gpm for ~~27~~ 2.8 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	5
Vandolah	5000	5
Wauchula Hills*	5000	4

Hauling Implemented

Net Discharge into the tank(s)

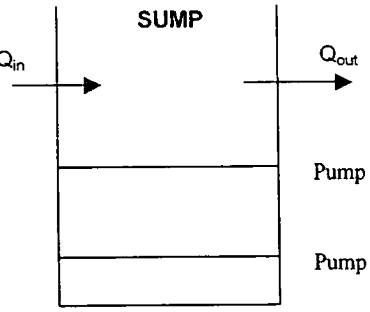
$\Sigma Q_{in\text{-}tank} =$	74,801	gal per time span
$\Sigma Q_{out\text{-}tank} =$	70,000	gal per time span
$V_{tank} =$	4,801	gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal

Average storm event that occurs on the Monday that follows a weekend with No hauling and the same storm event.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

SCS ENGINEERS		SHEET 4 of 4
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09
SUBJECT Leachate Balance Proposed System (Average Leachate Generation Conditions)	BY: LEK REVISED: LEK CHECKED JHO	DATE: 1/14/2004 11/9/2004 DATE 11/15/04



Pump On Elevation = 72

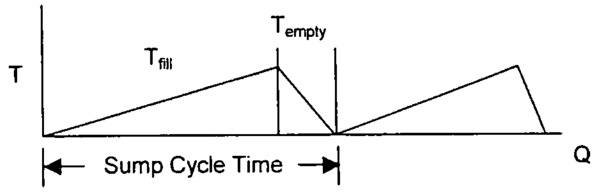
Pump Off Elevation = 71

Open Cell = 1 acres
Open Cell_{10ft} = 0 acres
Open Cell_{40ft} = 4 acres

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

$Q_{in} = Q_1 + \Sigma Q_2 =$ 20,635 gal/day = 14.3 gpm → 13,251 + 7,383 gpd from Sheet 1
$Q_{out} =$ 150 gpm

Time to Fill Sump = 26.2 min
Time to Empty Sump = 2.8 min
Sump Cycle Time = 29.0 min



Time Span = 63 hours
Represents a weekend with hauling on Saturday.

Cycles per Time Span = 130 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 415.7 gal

Every sump cycle time, the tank is filling at 150 gpm for ~~2.7~~ 2.8 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	5
Vandolah	5000	5
Wauchula Hills*	5000	1

Loads Hauled during the storm event

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$ 54,166 gal per time span
$\Sigma Q_{out\text{-}tank} =$ 55,000 gal per time span
$V_{tank} =$ -834 gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal

Average storm event that occurs over the weekend. The County hauls one day; therefore, a minimal amount of leachate accumulates in the tanks.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

[redacted]

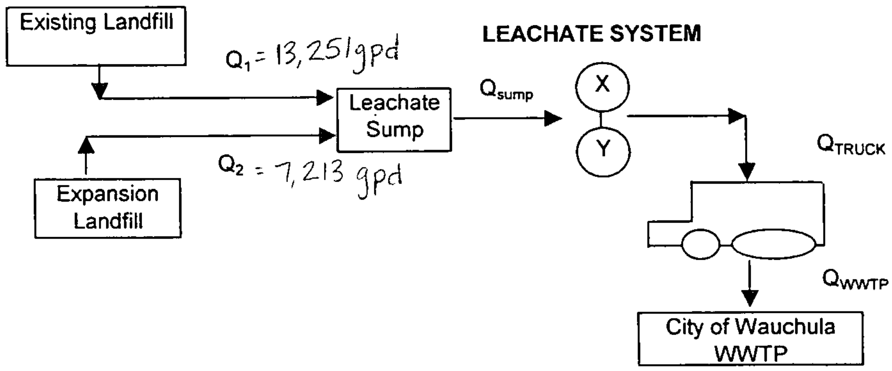
AVERAGE LEACHATE GENERATION CONDITIONS

(FIVE ACRES AT a 40 FOOT WASTE LIFT)

SCS ENGINEERS

SHEET 1 of 4		
CLIENT: Hardee County	PROJECT: Landfill Expansion	JOB NO. 09199033.09
SUBJECT: Leachate Balance	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004
Proposed System (Average Leachate Generation Conditions)	CHECKED JAO	DATE 11/15/04

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell =	0	acres								
Open Cell_{10ft} =	0	acres								
Open Cell_{40ft} =	5	acres								
Q_1^* =	4,836,780	gal/yr	=	13,251	gal/day					
	Collection System			Detection System						
$Q_{2\text{-Open}}^{**}$ =	77,435	ft³/yr-acre =		1,264	ft³/yr-acre =	1,613	gpd/acre	=	0	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft³/yr-acre =		1,504	ft³/yr-acre =	1,536	gpd/acre	=	0	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft³/yr-acre =		4,958	ft³/yr-acre =	1,443	gpd/acre	=	7,213	gal/day
ΣQ_2^{***} =						4,591	gpd/acre	=	7,213	gal/day

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

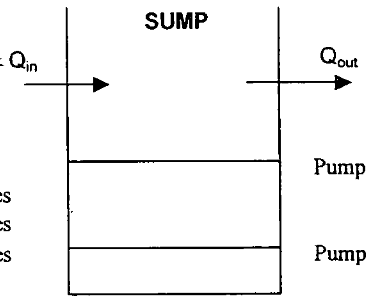
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT TAMPA

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004
Leachate Balance Proposed System (Average Leachate Generation Conditions)	CHECKED SHO	DATE 11/15/04

$20,465 \text{ gpd} = Q_{in}$



Pump On Elevation = 72

Pump Off Elevation = 71

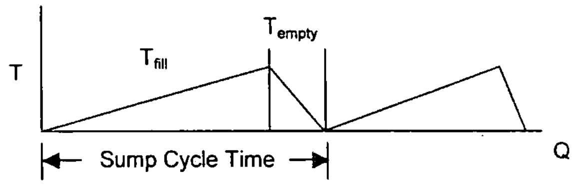
Open Cell = 0 acres
Open $Cell_{10ft}$ = 0 acres
Open $Cell_{40ft}$ = 5 acres

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 + 7,213 gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2$ = 20,465 gal/day = 14.2 gpm
Q_{out} = 150 gpm

Time to Fill Sump = 26.5 min = V/Q_{in}
Time to Empty Sump = +2.8 min = $V/Q_{out} - Q_{in}$
Sump Cycle Time = 29.2 min



Time Span = 63 hours
REPRESENTS A WEEKEND WITHOUT HAULING!

Cycles per Time Span = 129 times pumps will discharge into the tank per time span

→ 63 hrs / 29.2 min · hr / 60 min

$Q_{in-tank}$

$Q_{in-tank}$ = 415.3 gal = $Q_{out} \times 2.8$ min

Every sump cycle time, the tank is filling at 150 gpm for ~~2.8~~ 2.8 minutes, which equals the flow into the tank.

$Q_{out-tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	0
Vandolah	5000	0
Wauchula Hills*	5000	0

Net Discharge into the tank(s)

$\Sigma Q_{in-tank}$ = 53,720 gal per time span
$\Sigma Q_{out-tank}$ = 0 gal per time span
V_{tank} = 53,720 gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal

Average Storm event that occurs over the weekend. The County is NOT hauling; therefore, leachate accumulates in the tanks.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

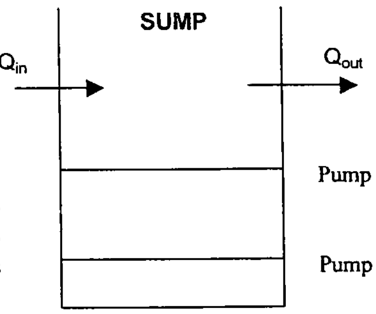
SCS ENGINEERS

SHEET 3 of 4

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK	DATE: 1/14/2004
Leachate Balance	REVISED: LEK	11/9/2004
Proposed System (Average Leachate Generation Conditions)	CHECKED SKO	DATE 11/15/04

20,465gpd =



Pump On Elevation = 72

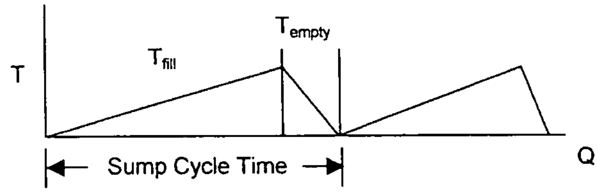
Open Cell = 0 acres
Open Cell$_{10ft}$ = 0 acres
Open Cell$_{40ft}$ = 5 acres

Pump Off Elevation = 71

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 + 7,213 gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2 =$ 20,465 gal/day = 14.2 gpm
$Q_{out} =$ 150 gpm



Time to Fill Sump = 26.5 min
Time to Empty Sump = 2.8 min
Sump Cycle Time = 29.2 min

Time Span = 24 hours
Represents the Monday following the weekend when leachate was not hauled.

Cycles per Time Span = 49 times pumps will discharge into the tank per time span

$Q_{in-tank}$

$Q_{in-tank} =$ 415.3 gal

Every sump cycle time, the tank is filling at 150 gpm for 2.8 minutes, which equals the flow into the tank.

$Q_{out-tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	5
Vandolah	5000	5
Wauchula Hills*	5000	4

Hauling Implemented

Net Discharge into the tank(s)

$\Sigma Q_{in-tank} =$ 74,184 gal per time span
$\Sigma Q_{out-tank} =$ 70,000 gal per time span
$V_{tank} =$ 4,184 gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000

Average Storm event that occurs on the Monday that follows a weekend with No Hauling and the same Storm event.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

NOV 19 2004

SOUTHWEST DISTRICT
TAMPA

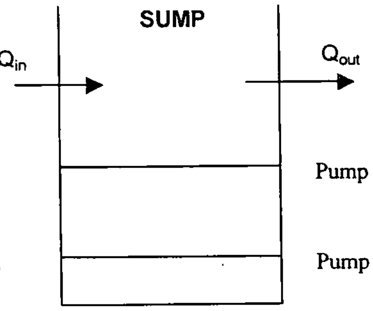
f://project/hardee/09199033.09/SWpermit/RAINo1/HELP/5acres_40ft/mon (no sat)

SCS ENGINEERS

SHEET 4 of 4

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT		
Leachate Balance	BY: LEK	DATE: 1/14/2004
	REVISED: LEK	11/9/2004
Proposed System (Average Leachate Generation Conditions)	CHECKED SAO	DATE 11/15/04



Pump On Elevation = 72

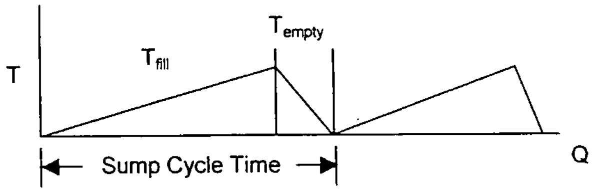
Pump Off Elevation = 71

Open Cell =	0	acres
Open Cell$_{10ft}$ =	0	acres
Open Cell$_{40ft}$ =	5	acres

Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

13,251 + 7,213gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2$ =	20,465	gal/day = 14.2 gpm
Q_{out} =	150	gpm
Time to Fill Sump =	26.5	min
Time to Empty Sump =	2.8	min
Sump Cycle Time =	29.2	min
Time Span =	63	**hours** Represents a weekend with hauling on Saturday.
Cycles per Time Span =	129	times pumps will discharge into the tank per time span



$Q_{in\text{-}tank}$

$Q_{in\text{-}tank}$ = 415.3 gal

Every sump cycle time, the tank is filling at 150 gpm for ~~2.7~~ 2.8 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	5
Vandolah	5000	5
Wauchula Hills*	5000	1

Loads hauled during the storm event

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank}$ =	53,720	gal per time span
$\Sigma Q_{out\text{-}tank}$ =	55,000	gal per time span
V_{tank} =	-1,280	gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal

Average storm event that occurs over the weekend. The County hauls one day; therefore, a minimal amount of leachate accumulates in the tanks.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT TAMPA

f://project/hardee/09199033.09/SWpermit/RAINo1/HELP/5acres_40ft/63 hr (sat)

[redacted]

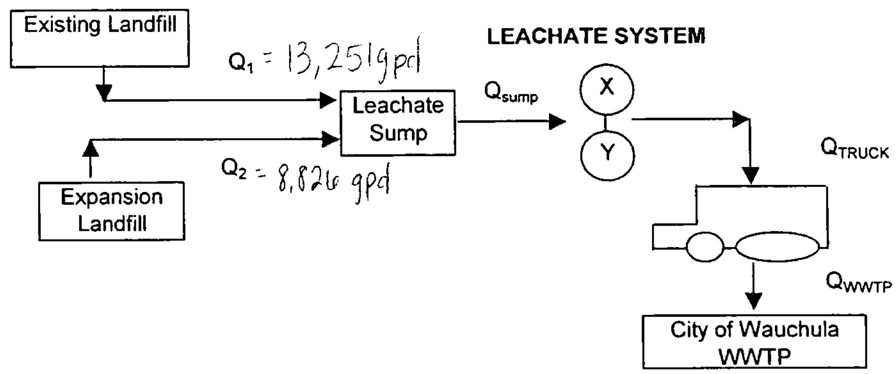
AVERAGE LEACHATE GENERATION CONDITIONS

(FIVE ACRES AT a 40 FOOT WASTE LIFT & ONE ACRE OPEN)

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004
Leachate Balance Proposed System (Average Leachate Generation Conditions)		CHECKED SKO	DATE 11/15/04

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell =	1	acres								
Open Cell_{10ft} =	0	acres								
Open Cell_{40ft} =	5	acres								
Q_1^{*} =	4,836,780	gal/yr =	13,251	gal/day						
	Collection System		Detection System							
$Q_{2\text{-Open}}^{**}$ =	77,435	ft^3/yr-acre =	1,264	ft^3/yr-acre =	1,613	gpd/acre =	1,613	gal/day		
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft^3/yr-acre =	1,504	ft^3/yr-acre =	1,536	gpd/acre =	0	gal/day		
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft^3/yr-acre =	4,958	ft^3/yr-acre =	1,443	gpd/acre =	7,213	gal/day		
ΣQ_2^{***} =					4,591	gpd/acre =	8,826	gal/day		

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

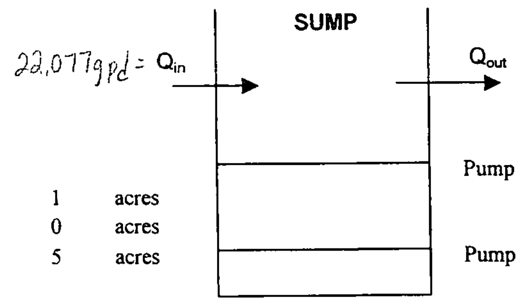
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT TAMPA

SCS ENGINEERS

SHEET 2 of 4

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK	DATE: 1/14/2004
Leachate Balance	REVISED: LEK	11/9/2004
Proposed System (Average Leachate Generation Conditions)	CHECKED JHO	DATE 11/15/04



Pump On Elevation = 72

Pump Off Elevation = 71

Open Cell =	1	acres
Open $Cell_{10ft}$ =	0	acres
Open $Cell_{40ft}$ =	5	acres

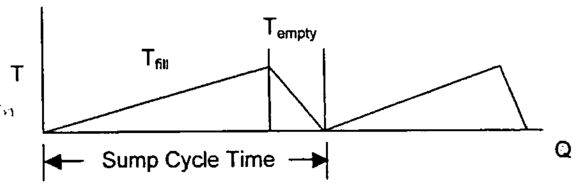
Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

13,251 + 8,826 gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2 =$ 22,077 gal/day = 15.3 gpm

$Q_{out} =$ 150 gpm

Time to Fill Sump =	24.5	min $= \forall / Q_{in}$
Time to Empty Sump =	+ 2.8	min $= \forall / (Q_{out} - Q_{in})$
Sump Cycle Time =	27.3	min



Time Span = **63** **hours**
REPRESENTS A WEEKEND WITHOUT HAULING!

Cycles per Time Span = 138 times pumps will discharge into the tank per time span

↳ 63 hrs / 27.3 min $\frac{hr}{60\ min}$

$Q_{in-tank}$

$Q_{in-tank} =$ 418.8 gal $= Q_{out} \times 2.8$ min.

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out-tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	0
Vandolah	5000	0
Wauchula Hills*	5000	0

No hauling

Net Discharge into the tank(s)

$\Sigma Q_{in-tank}$ =	57,953	gal per time span
$\Sigma Q_{out-tank}$ =	0	gal per time span
V_{tank} =	57,953	gal

(V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal

Average storm event that occurs over the weekend.
The County is <u>NOT</u> hauling; therefore, leachate accumulates in the tanks

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

NOV 19 2004

SOUTHWEST DISTRICT TAMPA

f://project/hardee/09199033.09/SWpermit/RAINo1/HELP/5acres_40ft-1acre_open/63 hr (no sat)

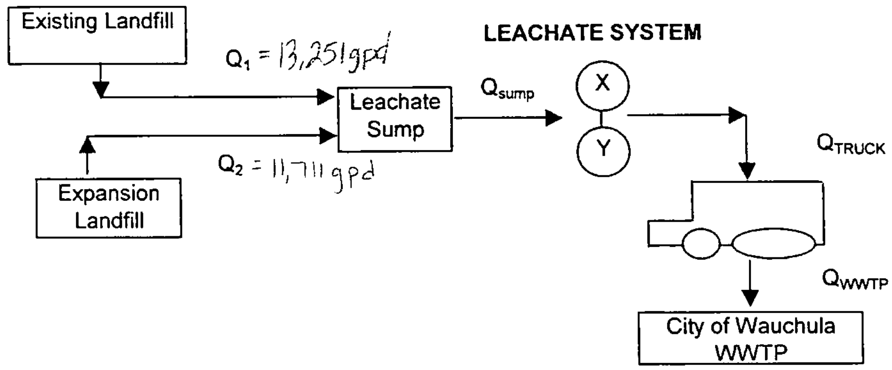
[redacted]

AVERAGE LEACHATE GENERATION CONDITIONS

(SEVEN ACRES AT a 40 FOOT WASTE LIFT & ONE ACRE OPEN)

SCS ENGINEERS		
SHEET 1 of 4		
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09
SUBJECT Leachate Balance Proposed System (Average Leachate Generation Conditions)	BY: LEK REVISED: LEK CHECKED SKP	DATE: 1/14/2004 11/9/2004 DATE 11/15/04

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

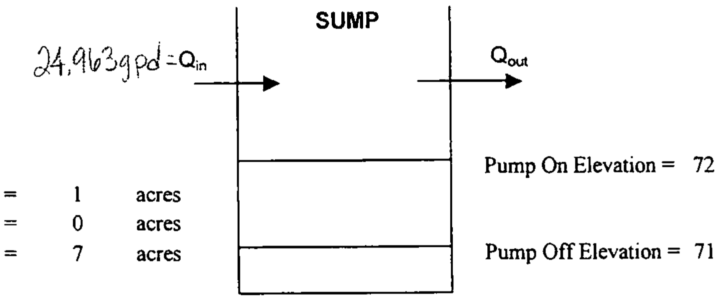
Open Cell =	1	acres								
Open $Cell_{10ft}$ =	0	acres								
Open $Cell_{40ft}$ =	7	acres								
Q_1^* =	4,836,780	gal/yr =	13,251	gal/day						
	Collection System		Detection System							
$Q_{2\text{-Open}}^{**}$ =	77,435	ft^3/yr-acre =	1,264	ft^3/yr-acre =	1,613	gpd/acre =	1,613	gal/day		
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft^3/yr-acre =	1,504	ft^3/yr-acre =	1,536	gpd/acre =	0	gal/day		
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft^3/yr-acre =	4,958	ft^3/yr-acre =	1,443	gpd/acre =	10,098	gal/day		
ΣQ_2^{***} =					4,591	gpd/acre =	11,711	gal/day		

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

SCS ENGINEERS		
	SHEET 2 of 4	
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09
SUBJECT Leachate Balance Proposed System (Average Leachate Generation Conditions)	BY: LEK REVISED: LEK CHECKED SHP	DATE: 1/14/2004 11/9/2004 DATE 11/15/04



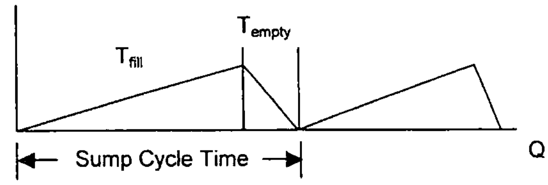
Open Cell = 1 acres
Open $Cell_{10ft}$ = 0 acres
Open $Cell_{40ft}$ = 7 acres

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 + 11,711 gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2$ = 24,963 gal/day = 17.3 gpm
Q_{out} = 150 gpm

Time to Fill Sump = 21.7 min = $\forall / Q_{in}$
Time to Empty Sump = + 2.8 min = $\forall / Q_{out} - Q_{in}$
Sump Cycle Time = 24.5 min



Time Span = 63 hours
REPRESENTS A WEEKEND WITHOUT HAULING!

Cycles per Time Span = 154 times pumps will discharge into the tank per time span
63 hrs/24.5 min $\frac{hr}{60 min}$

$Q_{in-tank}$

$Q_{in-tank}$ = 425.1 gal = $Q_{out} \times 2.8$ min.

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out-tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	0
Vandolah	5000	0
Wauchula Hills*	5000	0

No Hauling

Net Discharge into the tank(s)

$\Sigma Q_{in-tank}$ = 65,527 gal per time span
$\Sigma Q_{out-tank}$ = 0 gal per time span
V_{tank} = 65,527 gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol: 158,000 gal

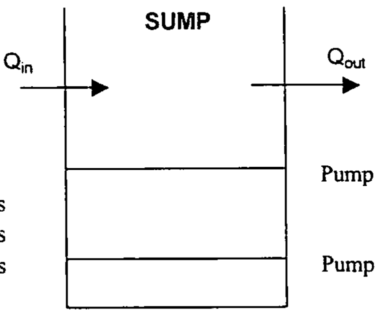
Average storm event that occurs over the weekend.
The County is NOT hauling; therefore, leachate accumulates in the tanks.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT TAMPA

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT		
Leachate Balance Proposed System (Average Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004
	CHECKED JHO	DATE 11/15/04

24,963 gpd = Q_{in}



Pump On Elevation = 72

Pump Off Elevation = 71

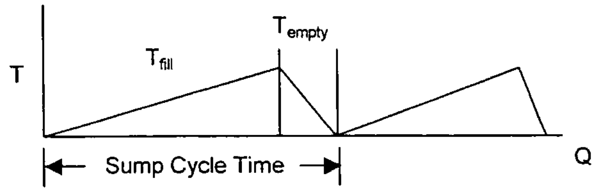
Open Cell = 1 acres
Open $Cell_{10ft}$ = 0 acres
Open $Cell_{40ft}$ = 7 acres

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 × 11,711 gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2 =$ 24,963 gal/day = 17.3 gpm
$Q_{out} =$ 150 gpm

Time to Fill Sump = 21.7 min = V/Q_{in}
Time to Empty Sump = + 2.8 min = $V/Q_{out} - Q_{in}$
Sump Cycle Time = 24.5 min



Time Span = 24 **hours**
Represents the Monday following the weekend when leachate was not hauled.

Cycles per Time Span = 59 times pumps will discharge into the tank per time span
24 hrs / 24.5 min $\frac{hr}{60 \text{ min}}$

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 425.1 gal = $Q_{out} \times 2.8$ min

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	5
Vandolah	5000	5
Wauchula Hills*	5000	8

Hauling Implemented

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$ 90,490 gal per time span
$\Sigma Q_{out\text{-}tank} =$ 90,000 gal per time span
$V_{tank} =$ 490 gal (V_{tank} represents the volume that will be stored in the tank)

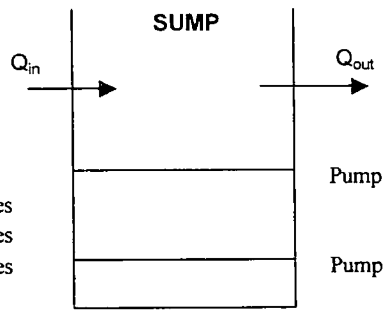
Max Tank Vol = 158,000 gal.

Average storm event that occurs on the Monday that follows a weekend with No hauling and the same storm event.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT TAMPA

SCS ENGINEERS		SHEET 4 of 4
CLIENT: Hardee County	PROJECT: Landfill Expansion	JOB NO. 09199033.09
SUBJECT: Leachate Balance Proposed System (Average Leachate Generation Conditions)	BY: LEK REVISED: LEK CHECKED: JHO	DATE: 1/14/2004 11/9/2004 DATE: 11/15/04

24,963gpd = Q_{in}



Pump On Elevation = 72

Pump Off Elevation = 71

Open Cell =	1	acres
Open Cell_{10ft} =	0	acres
Open Cell_{40ft} =	7	acres

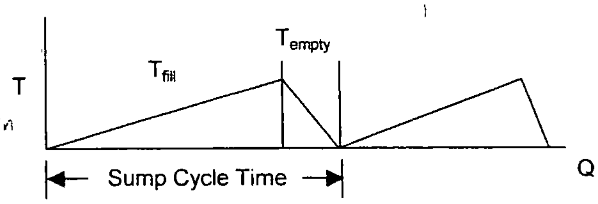
Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

13,251 + 11,711 gpd from Sheet 1

$Q_{in} = Q_1 + \Sigma Q_2$ = 24,963 gal/day = 17.3 gpm

Q_{out} = 150 gpm

Time to Fill Sump =	21.7	min = V/Q_{in}
Time to Empty Sump =	+ 2.8	min = $V/(Q_{out} - Q_{in})$
Sump Cycle Time =	24.5	min



Time Span = 63 **hours**
Represents a weekend with hauling on Saturday.

Cycles per Time Span = 154 times pumps will discharge into the tank per time span

→ 63 hrs/24.5 min $\frac{hr}{60\ min}$

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank}$ = 425.1 gal = $Q_{out} \times 2.8$ min.

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)
City of Wauchula	5000	5
Vandolah	5000	5
Wauchula Hills*	5000	4

Loads hauled during the storm event

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank}$ =	65,527	gal per time span
$\Sigma Q_{out\text{-}tank}$ =	70,000	gal per time span
V_{tank} =	-4,473	gal (V_{tank} represents the volume that will be stored in the tank)

Max Tank Vol = 158,000 gal.

Average storm event that occurs over the weekend. The County ha[illegible] therefore, a minimal amount of leachate accumulates in the tanks.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

[redacted]

PEAK LEACHATE GENERATION CONDITIONS

(TWO ACRES OPEN)

SCS ENGINEERS			
		SHEET 3	of
CLIENT Hardee County	PROJECT Landfill Expansion		JOB NO. 09199033.09
SUBJECT Leachate Balance Summary	BY: LEK		DATE: 11/9/2004
	CHECKED SHO		DATE 11/15/04

9.b) Please provide a summary of leachate generated considering the different scenarios and cover condition (i.e., number of open, intermediate and closed acres).

AVERAGE FLOW CONDITIONS

Scenario	Leachate Generated from Phase 1 (gal/day)	Leachate Generated from Phase 2 (gal/day)	Volume in Tanks after a Weekend of NO Hauling	No. of Loads if County Does NOT Hauls over the Weekend (loads/24hrs)	Volume in Tanks after a Weekend of Hauling (gal)	No. of Loads if County Hauls over the Weekend (loads/63 hrs)
2 Acres Open	13,251	3,226	43,252	12	0	9
2 Acres at a 10 ft Lift	13,251	3,072	42,849	12	0	9
2 Acres at a 10 ft Lift/0.75 Acre Open	13,251	4,685	47,082	13	18	9
3 Acres at a 40 ft Lift	13,251	4,328	46,146	13	1,146	9
3 Acres at a 40 ft Lift/1 Acre Open	13,251	5,941	50,379	14	379	10
4 Acres at a 40 ft Lift/1 Acre Open	13,251	7,383	54,166	14	0	11
5 Acres at a 40 ft Lift	13,251	7,213	53,720	14	0	11
5 Acres at a 40 ft Lift/1 Acre Open	13,251	8,826	57,953	16	31	12
7 Acres at a 40 ft Lift/1 Acre Open	13,251	11,711	65,527	18	490	14

This table represents the volume of leachate that is generated and stored in the holding tanks if an average storm event occurs. Columns four and five of the table shows the volume stored in the holding tanks should the rain event occur over the weekend. Column four portrays the volume of leachate stored over the weekend if the County does not haul leachate. Each holding tank is capable of storing 79,000 gallons of leachate. If the County does not haul over the weekend during the average storm event, the maximum amount of leachate stored in one tank is 65, 527 gallons. Column five demonstrates the amount of leachate that is stored in the holding tanks during the average storm event, yet the County is hauling the leachate.

PEAK FLOW CONDITIONS

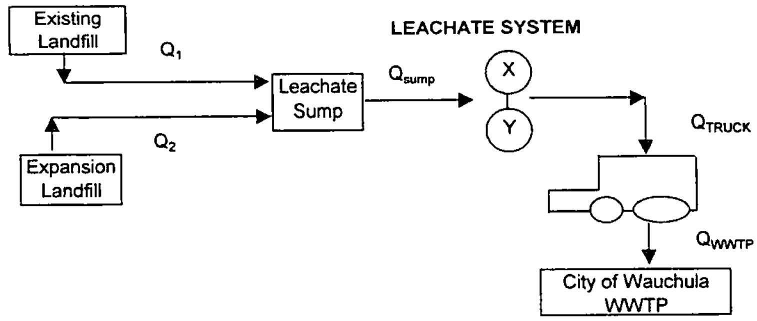
Scenario	Leachate Generated from Phase 1 (gal/day)	Leachate Generated from Phase 2 Peak Conditions (gal/day)	Leachate Generated from Phase 2 Average Conditions (gal/day)	Volume in Tanks after a Peak Storm Event with 48 hours of Hauling (gal)	No. of Loads if County Hauls for the Peak Storm Event (loads/48 hrs)
2 Acres Open	13,251	150,213	3,226	0	33
2 Acres at a 10 ft Lift	13,251	100,352	3,072	0	23
2 Acres at a 10 ft Lift/0.75 Acre Open	13,251	175,458	4,685	0	38
3 Acres at a 40 ft Lift	13,251	65,951	4,328	0	16
3 Acres at a 40 ft Lift/1 Acre Open	13,251	141,038	5,941	0	31
4 Acres at a 40 ft Lift/1 Acre Open	13,251	163,042	7,383	0	36
5 Acres at a 40 ft Lift	13,251	109,919	7,213	0	25
5 Acres at a 40 ft Lift/1 Acre Open	13,251	185,025	8,826	0	30
7 Acres at a 40 ft Lift/1 Acre Open	13,251	228,993	1,171	90,420	44

The peak storm event represents the 25 year/24 hour rainfall. Although the storm lasts 24 hours, it is estimated that the leachate will continue to fill the tanks until approximately 48 hours from the start of the storm event. This is attributed to the amount of time it takes the leachate to infiltrate the waste and flow through the leachate collection system to the sumps. Unlike the average storm event, the County should haul leachate as soon as the storm begins to prevent overflowing of the tanks. Column 5 shows the amount of leachate present in the tanks 48 hours after the storm has commenced. Column 6 reflects the amount of loads needed to be hauled in order to keep the leachate quantities at a manageable volume during and after the peak storm event.

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 1 9 2004
SOUTHWEST DISTRICT
TAMPA

SCS ENGINEERS			
	SHEET	of	
CLIENT: Hardee County	PROJECT: Landfill Expansion	JOB NO. 09199033.09	
SUBJECT: Leachate Balance Proposed System (Peak Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004	
	CHECKED: JHO	DATE 11/15/04	

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell =	2	acres
Open $Cell_{10ft}$ =	0	acres
Open $Cell_{40ft}$ =	0	acres

AVERAGE FLOW CONDITIONS

Q_1^{*} = 4,836,780 gal/yr = 13,251 gal/day

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	77,435	ft^3/yr-acre =	1,264	ft^3/yr-acre =	1,613	gpd/acre =	3,226	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft^3/yr-acre =	1,504	ft^3/yr-acre =	1,536	gpd/acre =	0	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft^3/yr-acre =	4,958	ft^3/yr-acre =	1,443	gpd/acre =	0	gal/day
ΣQ_2^{***} =					4,591	gpd/acre =	3,226	gal/day

PEAK FLOW CONDITIONS

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	10,012	ft^3/day-acre =	29	ft^3/day-acre =	75,107	gpd/acre =	150,213	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	6,678	ft^3/day-acre =	30	ft^3/day-acre =	50,176	gpd/acre =	0	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	2,868	ft^3/day-acre =	71	ft^3/day-acre =	21,984	gpd/acre =	0	gal/day
$\Sigma Q_{Peak\text{-}2}^{***}$ =					147,266	gpd/acre =	150,213	gal/day

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

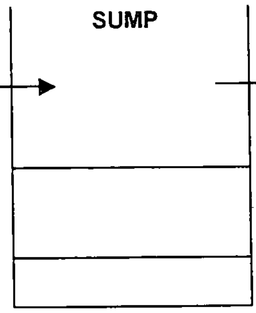
SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK	DATE: 1/14/2004
Leachate Balance	REVISED: LEK	11/9/2004
Proposed System (Peak Leachate Generation Conditions)	CHECKED JHO	DATE 11/15/04

163,465gpd = Q_{in} → Q_{out}



Pump On Elevation = 72

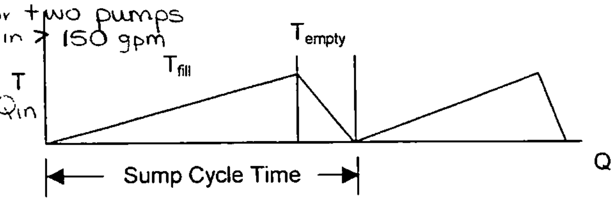
Open Cell = 2 acres
Open Cell$_{10ft}$ = 0 acres
Open Cell$_{40ft}$ = 0 acres

Pump Off Elevation = 71

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
∀ = Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 + 150,213
$Q_{in} = Q_1 + \Sigma Q_2 =$ 163,465 gal/day = 113.5 gpm
$Q_{out} =$ 150 gpm per pump for two pumps if Q_{in} > 150 gpm

Time to Fill Sump = 3.3 min = $\forall / Q_{in}$
Time to Empty Sump = + 2.0 min = $\forall / (Q_{out} - Q_{in})$
Sump Cycle Time = 5.3 min



Time Span = 48 hours
Represents the peak 24 hour storm event.

Cycles per Time Span = 541 times pumps will discharge into the tank per time span
48 hrs / 5.3 min $\frac{hr}{60 min}$

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank}$ = 302.4 gal = Q_{out} x 2.0 min.

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)	Hauling Frequency (load/48 hrs)
City of Wauchula	5000	5	10
Vandolah	5000	5	10
Wauchula Hills*	5000	12	13

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank}$ = 163,465 gal per time span
$\Sigma Q_{out\text{-}tank}$ = 165,000 gal per time span
V_{tank} = -1,535 gal

"Peak 24 hour storm event w/ the County hauling during the storm. The leachate should percolate through the waste 48 hours.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT TAMPA

f://project/hardee/09199033.09/SWPermit/HELP/Leachate Balance/Peak Conditions/2acres_open.xls/48 hr peak storm

[redacted]

PEAK LEACHATE GENERATION CONDITIONS

(TWO ACRES AT a 10 FOOT WASTE LIFT)

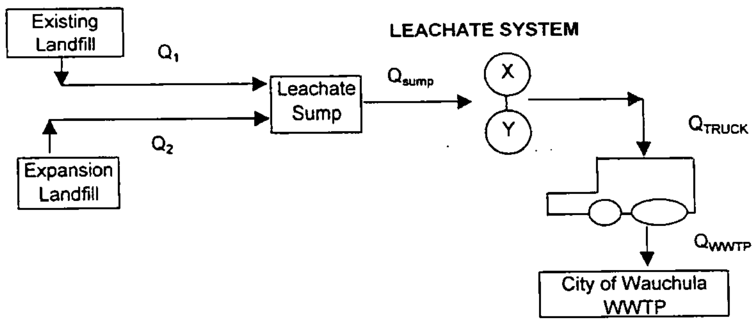
SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT		
Leachate Balance Proposed System (Peak Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004
	CHECKED JHO	DATE 11/15/04

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell =	0	acres
Open $Cell_{10ft}$ =	2	acres
Open $Cell_{40ft}$ =	0	acres

AVERAGE FLOW CONDITIONS

Q_1^{*} = 4,836,780 gal/yr = 13,251 gal/day

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	77,435	ft³/yr-acre =	1,264	ft³/yr-acre =	1,613	gpd/acre =	0	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft³/yr-acre =	1,504	ft³/yr-acre =	1,536	gpd/acre =	3,072	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft³/yr-acre =	4,958	ft³/yr-acre =	1,443	gpd/acre =	0	gal/day
ΣQ_2^{***} =					4,591	gpd/acre =	3,072	gal/day

PEAK FLOW CONDITIONS

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	10,012	ft³/day-acre =	29	ft³/day-acre =	75,107	gpd/acre =	0	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	6,678	ft³/day-acre =	30	ft³/day-acre =	50,176	gpd/acre =	100,352	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	2,868	ft³/day-acre =	71	ft³/day-acre =	21,984	gpd/acre =	0	gal/day
$\Sigma Q_{Peak\text{-}2}^{***}$ =					147,266	gpd/acre =	100,352	gal/day

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

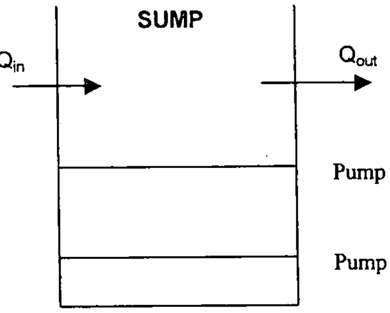
SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK / REVISED: LEK	DATE: 1/14/2004 / 11/9/2004
Leachate Balance Proposed System (Peak Leachate Generation Conditions)	CHECKED JHO	DATE 11/15/04

113,603gpd = Q_{in}



Open Cell = 0 acres
Open $Cell_{10ft}$ = 2 acres
Open $Cell_{40ft}$ = 0 acres

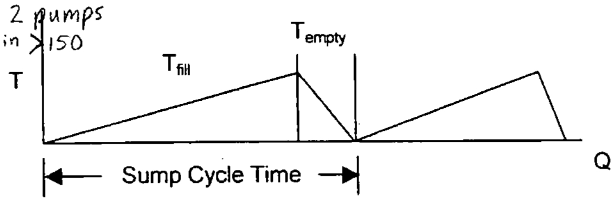
Pump On Elevation = 72

Pump Off Elevation = 71

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 + 100,352
$Q_{in} = Q_1 + \Sigma Q_2$ = 113,603 gal/day = 78.9 gpm
Q_{out} = 150 gpm per pump for 2 pumps if Q_{in} > 150

Time to Fill Sump = 4.8 min = V/Q_{in}
Time to Empty Sump = + 1.7 min = $V/Q_{out} - Q_{in}$
Sump Cycle Time = 6.5 min



Time Span = 48 **hours**
Represents the peak 24 hour storm event.

Cycles per Time Span = 445 times pumps will discharge into the tank per time span
48 hrs/6.5 min hr/60min

$Q_{in-tank}$

$Q_{in-tank}$ = 255.1 gal = Q_{out} x 1.7 min

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out-tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)	Hauling Frequency (load/48 hrs)
City of Wauchula	5000	5	10
Vandolah	5000	5	10
Wauchula Hills*	5000	12	3

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

Net Discharge into the tank(s)

$\Sigma Q_{in-tank}$ = 113,603 gal per time span
$\Sigma Q_{out-tank}$ = 115,000 gal per time span
V_{tank} = -1,397 gal

Peak 24 hour storm event w/ the County hauling during the storm. The leachate should perculate through the waste within 48 hours.

[redacted]

PEAK LEACHATE GENERATION CONDITIONS

(TWO ACRES AT a 10 FOOT WASTE LIFT & TWO ACRES OPEN)

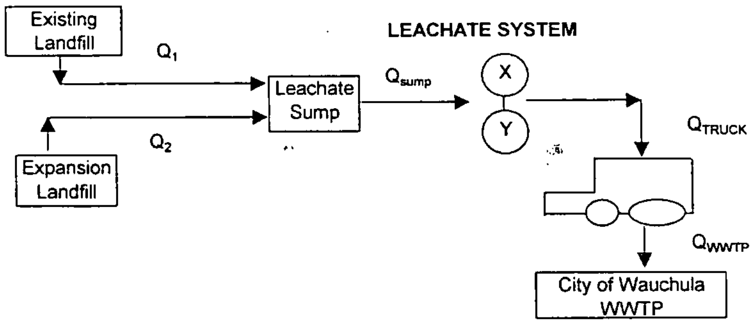
SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT		
Leachate Balance Proposed System (Peak Leachate Generation Conditions)	BY: LEK REVISED: LEK CHECKED JHG	DATE: 1/14/2004 11/9/2004 DATE 11/15/04

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell = 1 acres
Open Cell$_{10ft}$ = 2 acres
Open Cell$_{40ft}$ = 0 acres

AVERAGE FLOW CONDITIONS

Q_1^* = 4,836,780 gal/yr = 13,251 gal/day

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	77,435	ft^3/yr-acre =	1,264	ft^3/yr-acre =	1,613	gpd/acre =	1,613	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft^3/yr-acre =	1,504	ft^3/yr-acre =	1,536	gpd/acre =	3,072	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft^3/yr-acre =	4,958	ft^3/yr-acre =	1,443	gpd/acre =	0	gal/day
ΣQ_2^{***} =					4,591	gpd/acre =	4,685	gal/day

PEAK FLOW CONDITIONS

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	10,012	ft^3/day-acre =	29	ft^3/day-acre =	75,107	gpd/acre =	75,107	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	6,678	ft^3/day-acre =	30	ft^3/day-acre =	50,176	gpd/acre =	100,352	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	2,868	ft^3/day-acre =	71	ft^3/day-acre =	21,984	gpd/acre =	0	gal/day
$\Sigma Q_{Peak\text{-}2}^{***}$ =					147,266	gpd/acre =	175,458	gal/day

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

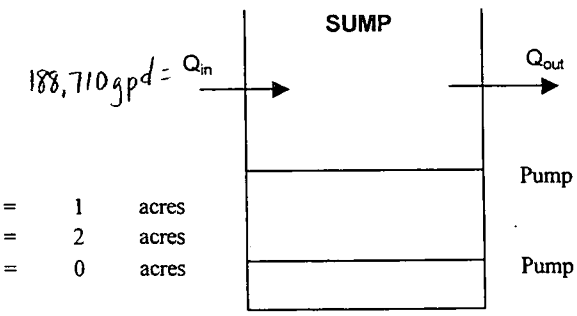
* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

SCS ENGINEERS		
	SHEET	of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY: LEK	DATE: 1/14/2004
Leachate Balance	REVISED: LEK	11/9/2004
Proposed System (Peak Leachate Generation Conditions)	CHECKED JHO	DATE 11/15/04



Pump On Elevation = 72

Pump Off Elevation = 71

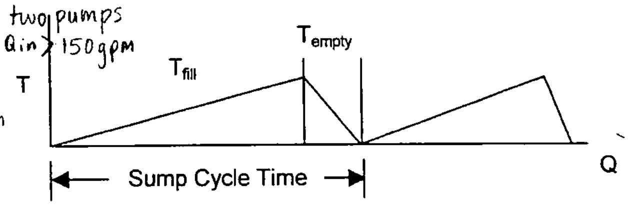
Open Cell = 1 acres
Open $Cell_{10ft}$ = 2 acres
Open $Cell_{40ft}$ = 0 acres

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 + 4,685

$Q_{in} = Q_1 + \Sigma Q_2$ = 188,710 gal/day = 131.0 gpm
Q_{out} = 150 gpm per pump for two pumps if Q_{in} > 150 gpm

Time to Fill Sump = 2.9 min = $\forall / Q_{in}$
Time to Empty Sump = + 2.2 min = $\forall / Q_{out} - Q_{in}$
Sump Cycle Time = 5.1 min



Time Span = 48 **hours**
Represents the peak 24 hour storm event.

Cycles per Time Span = 565 times pumps will discharge into the tank per time span
→ 48 hrs/5.1 min $\frac{hr}{60 min}$

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank}$ = 333.8 gal = Q_{out} × 2.2 min.

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)	Hauling Frequency (load/48 hrs)
City of Wauchula	5000	5	10
Vandolah	5000	5	10
Wauchula Hills*	5000	12	18

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank}$ = 188,710 gal per time span
$\Sigma Q_{out\text{-}tank}$ = 190,000 gal per time span
V_{tank} = -1,290 gal

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

Peak 24 hour storm event w/ the County hauling during the storm. The leachate should percolate through the waste within 48 hours.

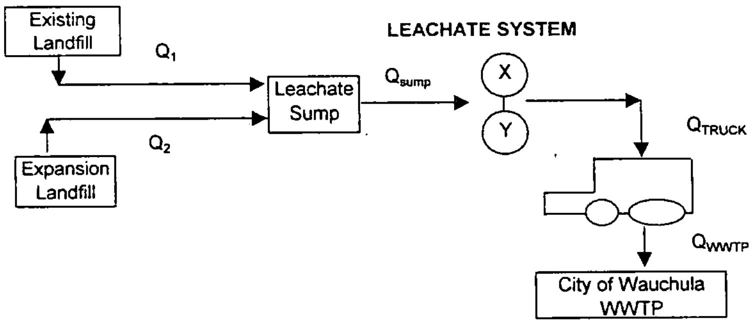
[redacted]

PEAK LEACHATE GENERATION CONDITIONS

(THREE ACRES AT a 40 FOOT WASTE LIFT)

SCS ENGINEERS			
		SHEET	of
CLIENT Hardee County	PROJECT Landfill Expansion		JOB NO. 09199033.09
SUBJECT Leachate Balance Proposed System (Peak Leachate Generation Conditions)		BY: LEK REVISED: LEK CHECKED JHO	DATE: 1/14/2004 11/9/2004 DATE 11/15/04

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell =	0	acres
Open $Cell_{10ft}$ =	0	acres
Open $Cell_{40ft}$ =	3	acres

AVERAGE FLOW CONDITIONS

Q_1^{*} = 4,836,780 gal/yr = 13,251 gal/day

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	77,435	ft^3/yr-acre =	1,264	ft^3/yr-acre =	1,613	gpd/acre =	0	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft^3/yr-acre =	1,504	ft^3/yr-acre =	1,536	gpd/acre =	0	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft^3/yr-acre =	4,958	ft^3/yr-acre =	1,443	gpd/acre =	4,328	gal/day
ΣQ_2^{***} =					4,591	gpd/acre =	4,328	gal/day

PEAK FLOW CONDITIONS

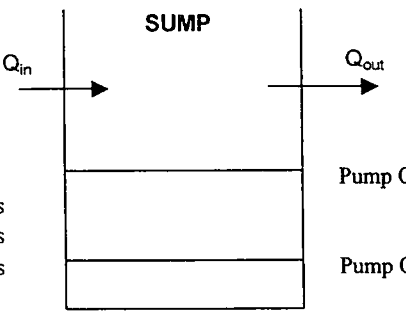
	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	10,012	ft^3/day-acre =	29	ft^3/day-acre =	75,107	gpd/acre =	0	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	6,678	ft^3/day-acre =	30	ft^3/day-acre =	50,176	gpd/acre =	0	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	2,868	ft^3/day-acre =	71	ft^3/day-acre =	21,984	gpd/acre =	65,951	gal/day
$\Sigma Q_{Peak\text{-}2}^{***}$ =					147,266	gpd/acre =	65,951	gal/day

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
DISTRICT
TAMPA

SCS ENGINEERS		
	SHEET of	
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09
SUBJECT Leachate Balance Proposed System (Peak Leachate Generation Conditions)	BY: LEK REVISED: LEK CHECKED JHG	DATE: 1/14/2004 11/9/2004 DATE 11/15/04



Pump On Elevation = 72

Pump Off Elevation = 71

Open Cell = 0 acres

Open $Cell_{10ft}$ = 0 acres

Open $Cell_{40ft}$ = 3 acres

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)

Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

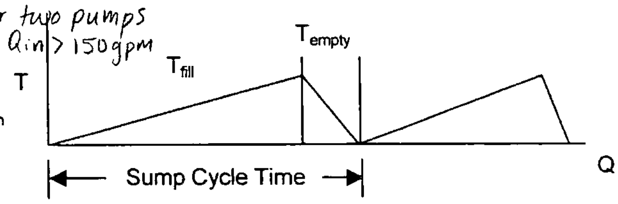
$Q_{in} = Q_1 + \Sigma Q_2$ = 79,203 gal/day = 55.0 gpm → 13,251 + 4,328

Q_{out} = 150 gpm per pump for two pumps if $Q_{in} > 150$ gpm

Time to Fill Sump = 6.8 min $= V/Q_{in}$

Time to Empty Sump = + 1.5 min $= V/(Q_{out} - Q_{in})$

Sump Cycle Time = 8.4 min



Time Span = **48** **hours**

Represents the peak 24 hour storm event.

Cycles per Time Span = 344 times pumps will discharge into the tank per time span

→ 48 hrs / 8.4 min $\frac{hr}{60 \text{ min}}$

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank}$ = 230.2 gal $= Q_{out} \times 1.5$ min.

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)	Hauling Frequency (load/48 hrs)
City of Wauchula	5000	5	10
Vandolah	5000	5	6
Wauchula Hills*	5000	12	0

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank}$ = 79,203 gal per time span

$\Sigma Q_{out\text{-}tank}$ = 80,000 gal per time span

V_{tank} = -797 gal

Peak 24 hour storm event w/ the County hauling during the storm. The leachate should percolate through the waste within 48 hours.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

f://project/hardee/09199033.09/SWPermit/HELP/Leachate Balance/Peak Conditions/3acres_40ft.xls/48 hr peak storm

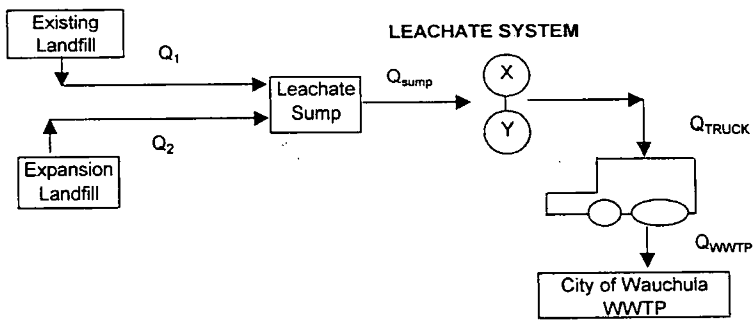
[redacted]

PEAK LEACHATE GENERATION CONDITIONS

(THREE ACRES AT a 40 FOOT WASTE LIFT & ONE ACRE OPEN)

SCS ENGINEERS			
		SHEET	of
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Leachate Balance Proposed System (Peak Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004	
	CHECKED JHO	DATE 11/15/04	

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell =	1	acres
Open Cell_{10ft} =	0	acres
Open Cell_{40ft} =	3	acres

AVERAGE FLOW CONDITIONS

Q_1^{*} = 4,836,780 gal/yr = 13,251 gal/day

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	77,435	ft³/yr-acre =	1,264	ft³/yr-acre =	1,613	gpd/acre =	1,613	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft³/yr-acre =	1,504	ft³/yr-acre =	1,536	gpd/acre =	0	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft³/yr-acre =	4,958	ft³/yr-acre =	1,443	gpd/acre =	4,328	gal/day
ΣQ_2^{***} =					4,591	gpd/acre =	5,941	gal/day

PEAK FLOW CONDITIONS

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	10,012	ft³/day-acre =	29	ft³/day-acre =	75,107	gpd/acre =	75,107	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	6,678	ft³/day-acre =	30	ft³/day-acre =	50,176	gpd/acre =	0	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	2,868	ft³/day-acre =	71	ft³/day-acre =	21,984	gpd/acre =	65,951	gal/day
$\Sigma Q_{Peak\text{-}2}^{***}$ =					147,266	gpd/acre =	141,058	gal/day

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

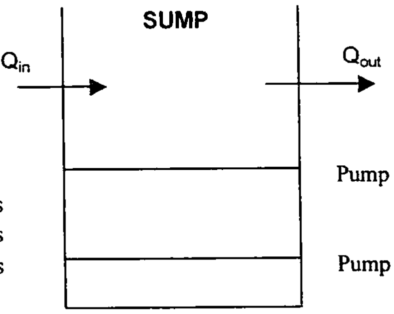
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
... DISTRICT
TAMPA

SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT		
Leachate Balance Proposed System (Peak Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004
	CHECKED JHO	DATE 11/15/04



Pump On Elevation = 72

Pump Off Elevation = 71

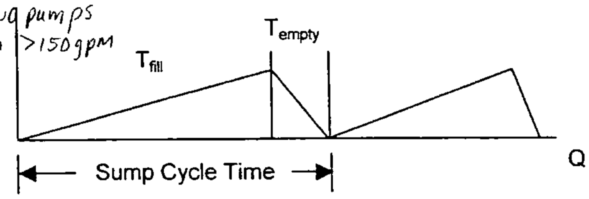
Open Cell = 1 acres
Open $Cell_{10ft}$ = 0 acres
Open $Cell_{40ft}$ = 3 acres

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 + 5,941

$Q_{in} = Q_1 + \Sigma Q_2$ = 154,309 gal/day = 107.2 gpm
Q_{out} = 150 gpm per pump for two pumps if Q_{in} >150gpm

Time to Fill Sump = 3.5 min = $\forall / Q_{in}$
Time to Empty Sump = +1.9 min = $\forall / (Q_{out} - Q_{in})$
Sump Cycle Time = 5.5 min



Time Span = 48 **hours**
Represents the peak 24 hour storm event.

Cycles per Time Span = 528 times pumps will discharge into the tank per time span

→ 48 hrs / 5.5 min $\frac{hr}{60 min}$

$Q_{in-tank}$

$Q_{in-tank}$ = 292.5 gal = $Q_{out} \times 1.9$ min

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out-tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)	Hauling Frequency (load/48 hrs)
City of Wauchula	5000	5	10
Vandolah	5000	5	10
Wauchula Hills*	5000	12	11

Net Discharge into the tank(s)

$\Sigma Q_{in-tank}$ = 154,309 gal per time span
$\Sigma Q_{out-tank}$ = 155,000 gal per time span
V_{tank} = -691 gal

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
DISTRICT
TAMPA

Peak 24 hour storm event w/ the County hauling during the storm. The leachate should percolate through the waste within 48 hours.

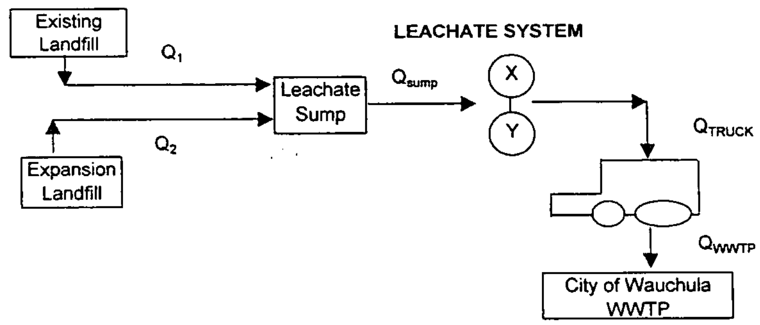
[redacted]

PEAK LEACHATE GENERATION CONDITIONS

(FOUR ACRES AT a 40 FOOT WASTE LIFT & ONE ACRE OPEN)

SCS ENGINEERS			
		SHEET	of
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Leachate Balance Proposed System (Peak Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004	
	CHECKED JHO	DATE 11/15/04	

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell =	1	acres
Open $Cell_{10ft}$ =	0	acres
Open $Cell_{40ft}$ =	4	acres

AVERAGE FLOW CONDITIONS

Q_1^{*} = 4,836,780 gal/yr = 13,251 gal/day

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	77,435	ft^3/yr-acre =	1,264	ft^3/yr-acre =	1,613	gpd/acre =	1,613	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft^3/yr-acre =	1,504	ft^3/yr-acre =	1,536	gpd/acre =	0	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft^3/yr-acre =	4,958	ft^3/yr-acre =	1,443	gpd/acre =	5,771	gal/day
ΣQ_2^{***} =					4,591	gpd/acre =	7,383	gal/day

PEAK FLOW CONDITIONS

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	10,012	ft^3/day-acre =	29	ft^3/day-acre =	75,107	gpd/acre =	75,107	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	6,678	ft^3/day-acre =	30	ft^3/day-acre =	50,176	gpd/acre =	0	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	2,868	ft^3/day-acre =	71	ft^3/day-acre =	21,984	gpd/acre =	87,935	gal/day
$\Sigma Q_{Peak\text{-}2}^{***}$ =					147,266	gpd/acre =	163,042	gal/day

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

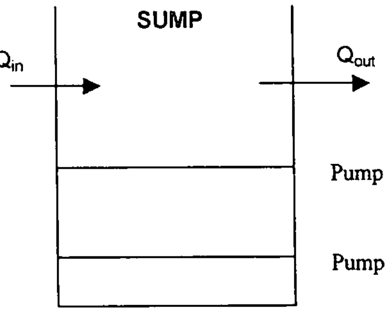
SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT		
Leachate Balance Proposed System (Peak Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004
	CHECKED JHO	DATE 11/15/04

176,293 gpd = Q_{in}



Pump On Elevation = 72

Open Cell = 1 acres
Open $Cell_{10ft}$ = 0 acres
Open $Cell_{40ft}$ = 4 acres

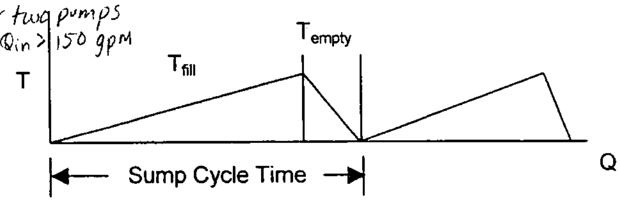
Pump Off Elevation = 71

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 + 7,383

$Q_{in} = Q_1 + \Sigma Q_2 =$ 176,293 gal/day = 122.4 gpm
$Q_{out} =$ 150 gpm per pump for two pumps if $Q_{in} > 150$ gpm

Time to Fill Sump = 3.1 min = $\forall / Q_{in}$
Time to Empty Sump = + 2.1 min = $\forall / (Q_{out} - Q_{in})$
Sump Cycle Time = 5.2 min



Time Span = 48 hours
Represents the peak 24 hour storm event.

Cycles per Time Span = 555 times pumps will discharge into the tank per time span
↳ 48 hrs/5.2 min $\frac{hr}{60 min}$

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 317.6 gal = $Q_{out} \times 2.1$ min

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)	Hauling Frequency (load/48 hrs)
City of Wauchula	5000	5	10
Vandolah	5000	5	10
Wauchula Hills*	5000	12	16

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$ 176,293 gal per time span
$\Sigma Q_{out\text{-}tank} =$ 180,000 gal per time span
$V_{tank} =$ -3,707 gal

Peak 24 hour storm event w/ the County hauling during the storm. Should percolate through the waste within 48 hours.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
... DISTRICT
TAMPA

[redacted]

PEAK LEACHATE GENERATION CONDITIONS

(FIVE ACRES AT a 40 FOOT WASTE LIFT)

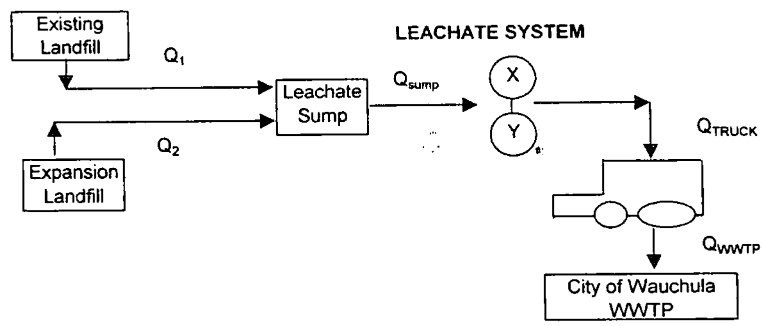
SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT		
Leachate Balance	BY: LEK	DATE: 1/14/2004
	REVISED: LEK	11/9/2004
Proposed System (Peak Leachate Generation Conditions)	CHECKED JHO	DATE 11/15/04

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell = 0 acres
Open $Cell_{10ft}$ = 0 acres
Open $Cell_{40ft}$ = 5 acres

AVERAGE FLOW CONDITIONS

Q_1^* = 4,836,780 gal/yr = 13,251 gal/day

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	77,435	ft³/yr-acre =	1,264	ft³/yr-acre =	1,613	gpd/acre =	0	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft³/yr-acre =	1,504	ft³/yr-acre =	1,536	gpd/acre =	0	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft³/yr-acre =	4,958	ft³/yr-acre =	1,443	gpd/acre =	7,213	gal/day
ΣQ_2^{***} =					4,591	gpd/acre =	7,213	gal/day

PEAK FLOW CONDITIONS

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	10,012	ft³/day-acre =	29	ft³/day-acre =	75,107	gpd/acre =	0	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	6,678	ft³/day-acre =	30	ft³/day-acre =	50,176	gpd/acre =	0	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	2,868	ft³/day-acre =	71	ft³/day-acre =	21,984	gpd/acre =	109,919	gal/day
$\Sigma Q_{Peak\text{-}2}^{***}$ =					147,266	gpd/acre =	109,919	gal/day

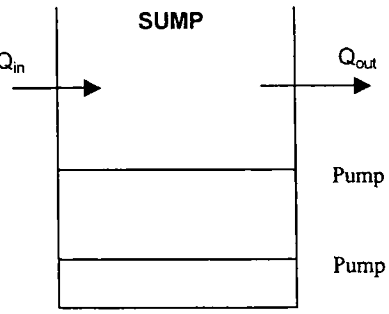
Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

SCS ENGINEERS			
		SHEET	of
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Leachate Balance Proposed System (Peak Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004	
	CHECKED JHO	DATE 11/15/04	

123,170gpd ~



Pump On Elevation = 72

Pump Off Elevation = 71

Open Cell =	0	acres
Open $Cell_{10ft}$ =	0	acres
Open $Cell_{40ft}$ =	5	acres

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)

Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 + 7,213

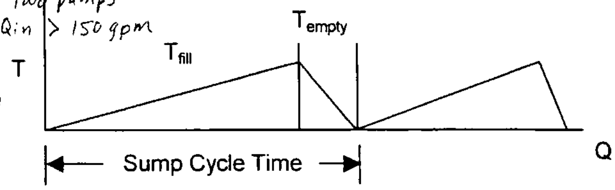
$Q_{in} = Q_1 + \Sigma Q_2$ = 123,170 gal/day = 85.5 gpm

Q_{out} = 150 gpm per pump for two pumps if Q_{in} > 150 gpm

Time to Fill Sump = 4.4 min = $\forall / Q_{in}$

Time to Empty Sump = + 1.8 min = $\forall / (Q_{out} - Q_{in})$

Sump Cycle Time = 6.1 min



Time Span = 48 hours

Represents the peak 24 hour storm event.

Cycles per Time Span = 468 times pumps will discharge into the tank per time span

48 hrs / 6.1 min $\frac{hr}{60 min}$

$Q_{in-tank}$

$Q_{in-tank}$ = 263.0 gal = Q_{out} x 1.8 min

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out-tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)	Hauling Frequency (load/48 hrs)
City of Wauchula	5000	5	10
Vandolah	5000	5	10
Wauchula Hills*	5000	12	5

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
DISTRICT
TAMPA

Net Discharge into the tank(s)

$\Sigma Q_{in-tank}$ =	123,170	gal per time span
$\Sigma Q_{out-tank}$ =	125,000	gal per time span
V_{tank} =	-1,830	gal

Peak 24 hour storm event w/ the County hauling during the storm. The leachate should percolate through the waste within 48 hours.

[redacted]

PEAK LEACHATE GENERATION CONDITIONS

(FIVE ACRES AT a 40 FOOT WASTE LIFT & ONE ACRE OPEN)

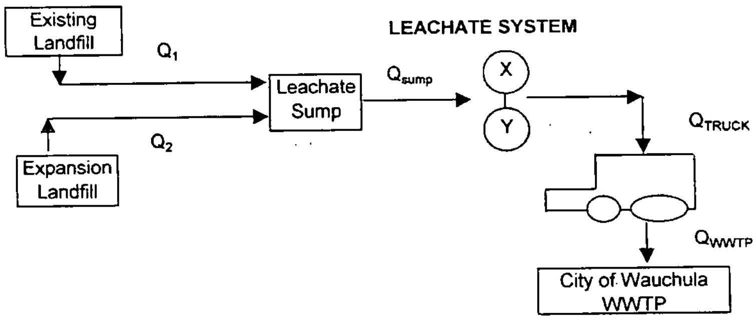
SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT		
Leachate Balance	BY: LEK	DATE: 1/14/2004
Proposed System (Peak Leachate Generation Conditions)	REVISED: LEK	11/9/2004
	CHECKED JHG	DATE 11/15/04

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell =	1	acres
Open $Cell_{10ft}$ =	0	acres
Open $Cell_{40ft}$ =	5	acres

AVERAGE FLOW CONDITIONS

Q_1^{*} = 4,836,780 gal/yr = 13,251 gal/day

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	77,435	ft³/yr-acre =	1,264	ft³/yr-acre =	1,613	gpd/acre =	1,613	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft³/yr-acre =	1,504	ft³/yr-acre =	1,536	gpd/acre =	0	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft³/yr-acre =	4,958	ft³/yr-acre =	1,443	gpd/acre =	7,213	gal/day
ΣQ_2^{***} =					4,591	gpd/acre =	8,826	gal/day

PEAK FLOW CONDITIONS

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	10,012	ft³/day-acre =	29	ft³/day-acre =	75,107	gpd/acre =	75,107	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	6,678	ft³/day-acre =	30	ft³/day-acre =	50,176	gpd/acre =	0	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	2,868	ft³/day-acre =	71	ft³/day-acre =	21,984	gpd/acre =	109,919	gal/day
$\Sigma Q_{Peak\text{-}2}^{***}$ =					147,266	gpd/acre =	185,025	gal/day

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

f://project/hardee/09199033.09/help/5acres_40ft-1acre_open.xls/proposed

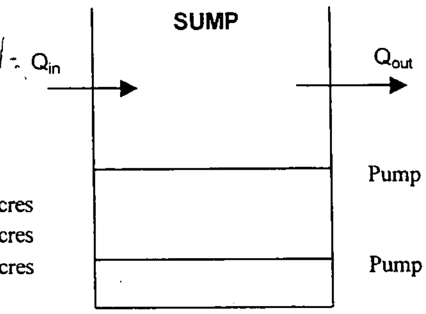
SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT		
Leachate Balance Proposed System (Peak Leachate Generation Conditions)	BY: LEK REVISED: LEK	DATE: 1/14/2004 11/9/2004
	CHECKED JHO	DATE 11/15/04

198,277gpd = Q_{in}



Pump On Elevation = 72

Pump Off Elevation = 71

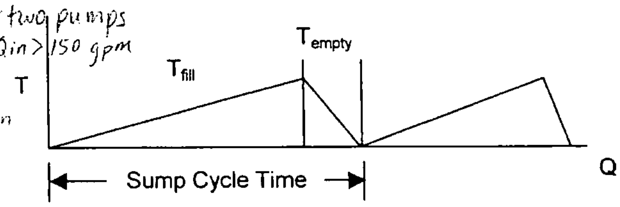
Open Cell = 1 acres
Open Cell$_{10ft}$ = 0 acres
Open Cell$_{40ft}$ = 5 acres

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 + 8,826

$Q_{in} = Q_1 + \Sigma Q_2 =$ 198,277 gal/day = 137.7 gpm
Q_{out} = 150 gpm per pump for two pumps if Qin > 150 gpm

Time to Fill Sump = 2.7 min = $\forall / Q_{in}$
Time to Empty Sump = + 2.3 min = $\forall / Q_{out} - Q_{in}$
Sump Cycle Time = 5.0 min



Time Span = 48 hours
Represents the peak 24 hour storm event.

Cycles per Time Span = 571 times pumps will discharge into the tank per time span

48 hrs / 5.0 min $\frac{hr}{60\ min}$

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank}$ = 347.5 gal = $Q_{out} \times 2.3$ min

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)	Hauling Frequency (load/48 hrs)
City of Wauchula	5000	5	10
Vandolah	5000	5	10
Wauchula Hills*	5000	12	20

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank}$ = 198,277 gal per time span
$\Sigma Q_{out\text{-}tank}$ = 200,000 gal per time span
V_{tank} = -1,723 gal

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

Peak 24 hour storm event w/ the County hauling during the storm. The leachate should percolate through the waste within 48 hours.

[redacted]

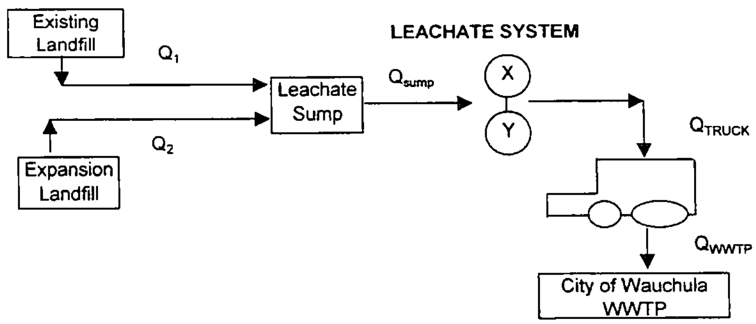
PEAK LEACHATE GENERATION CONDITIONS

(SEVEN ACRES AT a 40 FOOT WASTE LIFT & ONE ACRE OPEN)

SCS ENGINEERS

SHEET		of	
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Leachate Balance	BY: LEK	DATE: 1/14/2004	
Proposed System (Peak Leachate Generation Conditions)	REVISED: LEK	11/9/2004	
	CHECKED JHO	DATE 11/15/04	

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell =	1	acres
Open Cell$_{10ft}$ =	0	acres
Open Cell$_{40ft}$ =	7	acres

AVERAGE FLOW CONDITIONS

Q_1^{*} = 4,836,780 gal/yr = 13,251 gal/day

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	77,435	ft³/yr-acre =	1,264	ft³/yr-acre =	1,613	gpd/acre =	1,613	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	73,445	ft³/yr-acre =	1,504	ft³/yr-acre =	1,536	gpd/acre =	0	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	65,438	ft³/yr-acre =	4,958	ft³/yr-acre =	1,443	gpd/acre =	10,098	gal/day
ΣQ_2^{***} =					4,591	gpd/acre =	11,711	gal/day

PEAK FLOW CONDITIONS

	Collection System		Detection System					
$Q_{2\text{-Open}}^{**}$ =	10,012	ft³/day-acre =	29	ft³/day-acre =	75,107	gpd/acre =	75,107	gal/day
$Q_{2\text{-10ft waste}}^{**}$ =	6,678	ft³/day-acre =	30	ft³/day-acre =	50,176	gpd/acre =	0	gal/day
$Q_{2\text{-40ft waste}}^{**}$ =	2,868	ft³/day-acre =	71	ft³/day-acre =	21,984	gpd/acre =	153,886	gal/day
$\Sigma Q_{Peak\text{-}2}^{***}$ =					147,266	gpd/acre =	228,993	gal/day

Q_{sump} =	150	gpm	Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm	Max pump rate (Attachment 3)
Q_{WWTP} =	250	gpm	Max discharge rate into WWTP (Attachment 3)
Q_{WWTP} =	25,000	gpd	Max daily limit into WWTP (Attachment 3)
Tank X =	79,000	gal	Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal	Max single holding tank volume (Attachment 3)
Loading Time =	10	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
Unloading Time =	30	min/load	per Hardee County
Haul Time =	15	min/load	per Hardee County (3 mile trip, one way)
ΣTruck Time =	70	min/load	
V_{TRUCK} =	5,000	gal/load	
Q_{truck} =	71.4	gpm	

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT TAMPA

* 2003 Leachate Quantity (Attachment 1)
** Primary/Secondary System, HELP Model (Attachment 2)
*** $\Sigma Q_2 = Q_{2\text{-Open}} + Q_{2\text{-10ft waste}} + Q_{2\text{-40ft waste}}$

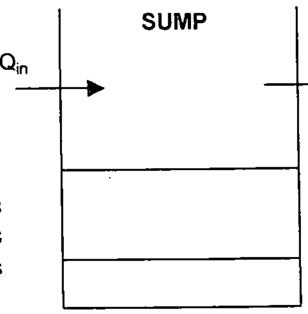
f://project/hardee/09199033.09/help/7acres_40ft-1acre_open.xls/proposed

SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT		
Leachate Balance	BY: LEK	DATE: 1/14/2004
Proposed System (Peak Leachate Generation Conditions)	REVISED: LEK	11/9/2004
	CHECKED SKO	DATE 11/15/04



Pump On Elevation = 72

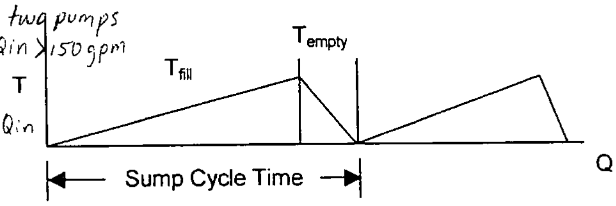
Pump Off Elevation = 71

Open Cell = 1 acres
Open Cell_{10ft} = 0 acres
Open Cell_{40ft} = 7 acres

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

13,251 + 11,711
$Q_{in} = Q_1 + \Sigma Q_2$ = 242,244 gal/day = 168.2 gpm
Q_{out} = 150 gpm per pump for two pumps if Qin > 150 gpm

Time to Fill Sump = 2.2 min = $\forall / Q_{in}$
Time to Empty Sump = + 1.3 min = $\forall / 2Q_{out} - Q_{in}$
Sump Cycle Time = 3.5 min



Time Span = 48 **hours**
Represents the peak 24 hour storm event.

Cycles per Time Span = 826 times pumps will discharge into the tank per time span

$\hookrightarrow$ 48 hrs/3.5 min $\frac{hr}{60\ min}$

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank}$ = 376.0 gal = $Q_{out} \times 1.3$ min.

Every sump cycle time, the tank is filling at 150 gpm for 2.7 minutes, which equals the flow into the tank.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)	Hauling Frequency (load/48 hrs)
City of Wauchula	5000	5	10
Vandolah	5000	5	10
Wauchula Hills*	5000	12	24

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank}$ = 310,420 gal per time span
$\Sigma Q_{out\text{-}tank}$ = 220,000 gal per time span
V_{tank} = 90,420 gal

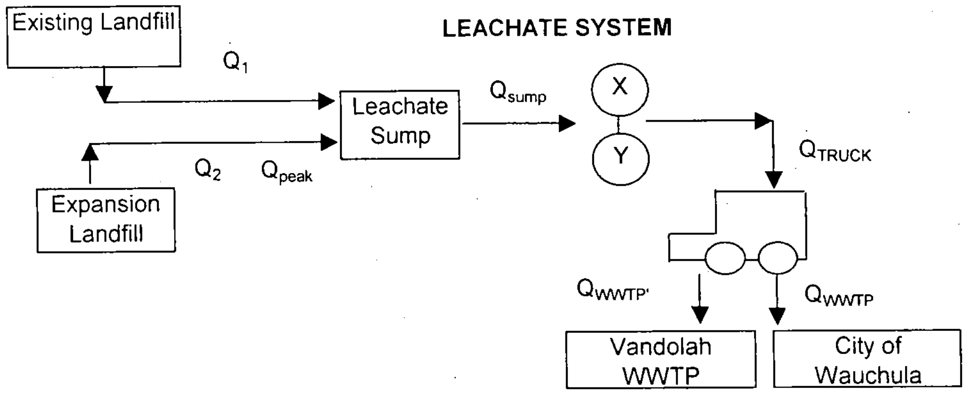
Peak 24 hour storm event w/ the County hauling during the storm. The leachate should percolate through the waste within 48 hours.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

Leachate Balance
Proposed System
(Peak Leachate Generation Conditions)

SCS ENGINEERS			
SHEET of			
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Leachate Balance Proposed System (Peak Leachate Generation Conditions)	BY LEK	DATE 1/14/2004	
	CHECKED JHW	DATE	

TASK: Determine how many loads of leachate a tanker truck must deliver in order to keep one tank empty.



GIVEN:

Open Cell =	2	acres				
Q_1 =	4,836,780	gal/yr	=	13,251	gal/day	(2003 Leachate Quantity, Attachment 1)
Q_2 =	1,587	gpd/acre	=	3,174	gal/day	Primary/Secondary System, HELP Model (Attachment 2)
Q_{peak} =	74,890	gpd/acre	=	149,780	gal/day	Primary/Secondary System, HELP Model (Attachment 2)
Q_{sump} =	150	gpm				Max flow for each sump pump (Attachment 3)
Tank Pump =	600	gpm				Max pump rate (Attachment 3)
Tank X =	79,000	gal				Max single holding tank volume (Attachment 3)
Tank Y =	79,000	gal				Max single holding tank volume (Attachment 3)

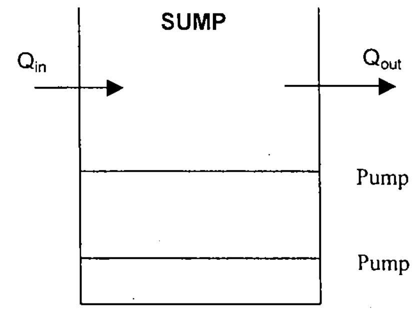
23/1

SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Leachate Balance Proposed System (Peak Leachate Generation Conditions)	LEK	1/14/2004
	CHECKED	DATE



Pump On Elevation = 72

Pump Off Elevation = 71

Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

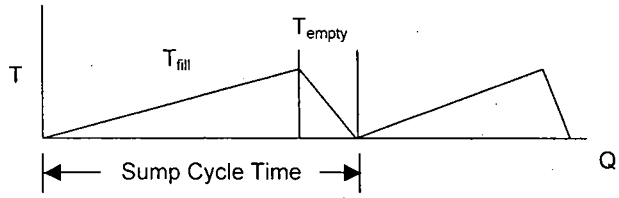
$Q_{in} = Q_1 + Q_{peak} =$ 163,031 gal/day = 113.2 gpm

$Q_{out} =$ 300 gpm

Time to Fill Sump = 3.3 min

Time to Empty Sump = 2.0 min

Sump Cycle Time = 5.3 min



Time Span = 48 hours

Represents the peak 28 hour storm event.

Cycles per Time Span = 540 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 603.9 gal

Every 5.3 minutes, the tank is filling at 150 gpm for 2.0 minutes, which equals 607.1 gallons.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load/day)	Hauling Frequency (load/48 hrs)
City of Wauchula	5000	5	10
Vandolah	5000	5	10
Wauchula Hills*	5000	12.6	25.2

Net Discharge into the tank(s)

$\Sigma Q_{in\text{-}tank} =$ 326,062 gal per time span

$\Sigma Q_{out\text{-}tank} =$ 226,000 gal per time span

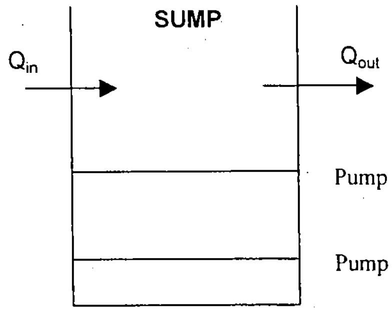
$V_{tank} =$ 100,062 gal

SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Leachate Balance	LEK	1/14/2004
Proposed System (Peak Leachate Generation Conditions)	CHECKED JHO	DATE



Pump On Elevation = 72

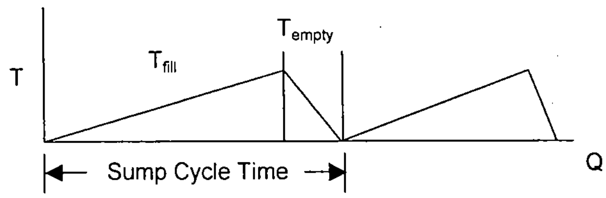
Pump Off Elevation = 71

Sump Diameter =	8	ft	(PBS&J Record Drawings, July 2000)
Sump Volume =	50.3	cf between elevations 71 and 72	(PBS&J Record Drawings, July 2000)

$Q_{in} = Q_1 + Q_2 =$ 16,425 gal/day = 11.4 gpm

$Q_{out} =$ 150 gpm

Time to Fill Sump =	33.0	min
Time to Empty Sump =	2.7	min
Sump Cycle Time =	35.7	min



Time Span = 63 hours

Cycles per Time Span = 106 times pumps will discharge into the tank per time span

$Q_{in-tank}$

$Q_{in-tank} =$ 406.9 gal

Every 35.4 minutes, the tank is filling at 150 gpm for 2.7 minutes, which equals 407.2 gallons.

$Q_{out-tank}$

	V_{truck} (gal/load)	Hauling Frequency (load)
City of Wauchula	5000	5
City of Wauchula	5000	5
Wauchula Hills*	5000	12.6

Net Discharge into tank(s)

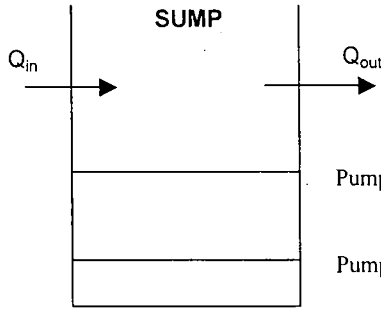
$\Sigma Q_{in-tank} =$	143,178	gal per time span
$\Sigma Q_{out-tank} =$	113,000	gal per time span
$V_{tank} =$	30,178	gal

SCS ENGINEERS

SHEET of

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Leachate Balance	LEK	1/14/2004
Proposed System (Peak Leachate Generation Conditions)	CHECKED JHP	DATE



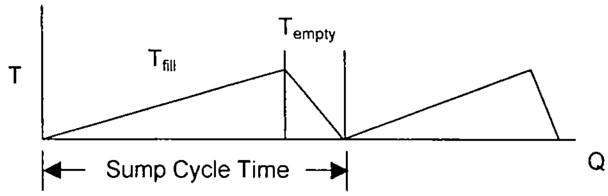
Pump On Elevation = 72

Pump Off Elevation = 71

Sump Diameter = 8 ft (PBS&J Record Drawings, July 2000)
Sump Volume = 50.3 cf between elevations 71 and 72 (PBS&J Record Drawings, July 2000)

$Q_{in} = Q_1 + Q_2 =$ 16,425 gal/day = 11.4 gpm
$Q_{out} =$ 150 gpm

Time to Fill Sump = 33.0 min
Time to Empty Sump = 2.7 min
Sump Cycle Time = 35.7 min



Time Span = 24 hours

Cycles per Time Span = 40 times pumps will discharge into the tank per time span

$Q_{in\text{-}tank}$

$Q_{in\text{-}tank} =$ 406.9 gal

Every 35.4 minutes, the tank is filling at 150 gpm for 2.7 minutes, which equals 407.2 gallons.

$Q_{out\text{-}tank}$

	V_{truck} (gal/load)	Hauling Frequency (load)
City of Wauchula	5000	5
City of Wauchula	5000	5
Wauchula Hills*	5000	0

Net Discharge into tank(s)

$\Sigma Q_{in\text{-}tank} =$ 46,603 gal per time span
$\Sigma Q_{out\text{-}tank} =$ 50,000 gal per time span
$V_{tank} =$ -3,397 gal

Attachments

Attachment 1
1/1

SCS ENGINEERS

SHEET 1 of 1

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Leachate Quantities	LEK	1/7/2004
	CHECKED JHO	DATE

Goal: Determine the anticipated annual leachate quantities for financial assurance.

Year	Leachate Quantity Treated	Annual Rainfall	Comments
	gallons	*inches*	
1997	4,955,000	65.94	Operations included the open storage ditch.
1998	5,793,532	66.05	Operations included the open storage ditch.
1999	1,910,230	38.27	Operations included the open storage ditch.
2000	2,002,320	30.46	TOTAL leachate generated for 2000.
	1,158,750		Gallons treated from the open storage ditch.
	843,570		Gallons treated from the tanks.
2001*	5,969,149	50.12	TOTAL leachate generated for 2001.
	3,733,782		Gallons treated from the open storage ditch.
	1,549,387		Gallons treated from the tanks.
2002	7,394,876	62.21	Open storage ditch was filled in on April 20, 2002.
2003**	4,836,780	51.04	

*Disaster declared in September 2001 due to Hurricane Gabriel (14" of rainfall in two days). Delta Pioneer was contracted to haul 1,002,000 gallons of leachate to Manatee Wastewater Treatment Plant under the Emergency Declaration.

**Disaster declared in June of 2003 due to flood (6" of rainfall in two days).

Represents the annual quantities of leachate treated.

Conclusion: The 2003 quantity of 4,836,780 gal/year represents the most accurate leachate quantity that the site could expect to receive upon closure. The leachate quantities prior to 2003 are not representative of current quantities due to the open storage ditch. The previous leachate quantities include dewatering of the open storage ditch.

Q_1 = leachate from existing landfill cell = 4,836,780 gal/yr

Attachment 2
1/2
Avg Q

SCS ENGINEERS

SHEET 1 of 1

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
HELP Model Summary Annual Average Values	LEK	2/11/2004
	CHECKED JD	DATE

Case 1, Waste Depth = 0 feet

	Collection System, k = 17.7 cm/s			Detection System, k = 26.2 cm/s		
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)
Length = 45.6 ft Slope = 2.19%	0.001	$\boxed{77,435}$	1.10	0.000	1,264	0.02
Length = 67.0 ft Slope = 3.13%	0.001	77,149	1.10	0.000	1,278	0.02
Length = 63.7 ft Slope =2.81%	0.001	76,754	1.09	0.000	1,310	0.02

$Q_2 = 77,435 \frac{ft^3}{yr} \times \frac{7.48 gal}{ft^3} \times \frac{y}{36}$
$= 1587$ gpd/acre

Case 2 - Waste Depth = 10 feet

	Collection System, k = 6.8 cm/s			Detection System, k = 13.4 cm/s		
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)
Length = 47.2 ft Slope = 2.02%	0.003	67,002	0.95	0.000	2,054	0.03
Length = 77.3 ft Slope = 2.14%	0.005	65,761	0.94	0.000	2,524	0.04

Case 3 - Waste Depth = 40 feet

	Collection System, k = 6.8 cm/s			Detection System, k = 13.4 cm/s		
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)
Length = 77.3 ft Slope = 2.14%	0.005	66,825	0.95	0.001	4,994	0.07

Case 4 - Waste Depth = 69.5 feet

	Collection System, k = 6.8 cm/s			Detection System, k = 13.4 cm/s		
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)
Length = 77.3 ft Slope = 2.14%	0.005	65,690	0.93	0.000	2,604	0.04

Note: All flowrates are based on a per acre basis.

Attachment 2
2/2
Peak Q

SCS ENGINEERS

SHEET 1 of 1

CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT HELP Model Summary Peak Daily Values		BY LEK	DATE 2/11/2004
		CHECKED JHB	DATE

Case 1, Waste Depth = 0 feet

	Collection System, k = 17.7 cm/s			Detection System, k = 26.2 cm/s		
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)
Length = 45.6 ft Slope = 2.19%	0.110	$\boxed{10,012}$	52.01	0.000	29	0.15
Length = 67.0 ft Slope = 3.13%	0.115	9,997	51.93	0.000	29	0.15
Length = 63.7 ft Slope =2.81%	0.119	9,784	50.82	0.000	30	0.16

$Q_{peak} = 10{,}012 \frac{ft^3}{d} \times \frac{7.48\ gal}{ft^3}$
$= 74{,}890 \frac{gpd}{acre}$

Case 2 - Waste Depth = 10 feet

	Collection System, k = 6.8 cm/s			Detection System, k = 13.4 cm/s		
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)
Length = 47.2 ft Slope = 2.02%	0.192	6,080	31.58	0.001	42	0.22
Length = 77.3 ft Slope = 2.14%	0.282	5,741	29.82	0.001	51	0.27

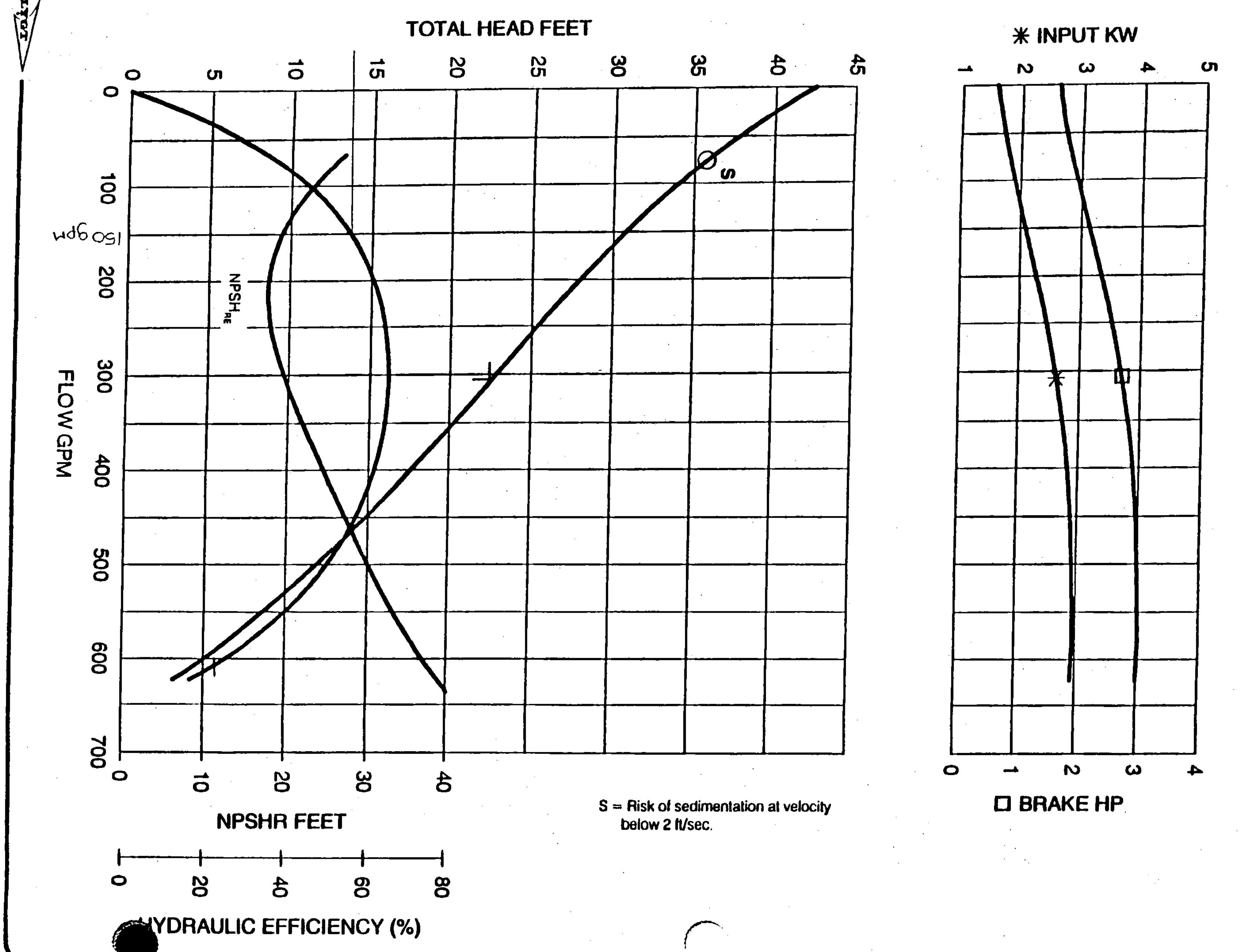
Case 3 - Waste Depth = 40 feet

	Collection System, k = 6.8 cm/s			Detection System, k = 13.4 cm/s		
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)
Length = 77.3 ft Slope = 2.14%	0.150	2,996	15.56	0.003	73	0.38

Case 4 - Waste Depth = 69.5 feet

	Collection System, k = 6.8 cm/s			Detection System, k = 13.4 cm/s		
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/day)	Leachate Collected (gal/min)
Length = 77.3 ft Slope = 2.14%	0.100	1,984	10.31	0.001	30	0.15

Note: All flowrates are based on a per acre basis.



S = Risk of sedimentation at velocity below 2 ft/sec.

PAGE	4
SECTION	3
ISSUED	2/96
SUPERSEDES	6/94

C-3085
434 Impeller

CONFIG.	CP/CS
VANES	1
PHASE	3

Source: Responses to RAI Dated July 25, 1997
Application for Construction Permit
December 1997

MEMORANDUM

TO: Jim Flynt, P.E.
Maureen Mauriello, P.E.

FROM: Craig Ferguson, P.E. CAF

RE: **HARDEE COUNTY LANDFILL**
Leachate Water Balance

DATE: **August 25, 1997**

In response to a portion of Item 11b, of the July 25, 1997 FDEP letter, presented below is a water balance for the projected leachate from the Hardee County Landfill. The water balance discussion is divided into the following categories:

1. Leachate Generation
2. Leachate Collection Pump Station
3. Leachate Storage
4. Truck Loading Pump Station
5. Hauling and Disposal

LEACHATE GENERATION

Leachate quantity projections for the Hardee County Landfill were developed using the Hydrogeologic Evaluation of landfill Performance (HELP) computer model. Included as Appendix A to this memorandum are five separate HELP model runs used for this project to represent the following five landfill operating categories:

1. Open Area -- Area within the containment system that has not yet received solid waste.
2. Working Face
3. Daily Covered Area
4. Intermediate Covered Area
5. Final Covered Area

The five HELP model runs were used to project leachate quantity generated on a per acre basis. Having the projected leachate generation rate per acre, the total quantity of leachate generation is established by multiplying these values by the projected number of acres for each operating category.

The average annual leachate generation rate per acre is represented in the HELP model as the lateral drainage from layer 1 for all operating categories except final cover. The final cover average leachate quantity is defined as the percolation/leakage through layer 3. The maximum values are derived by calculating the maximum sum of the monthly flow values, plus two standard deviations.

Typically in containment type landfills, there is also an inflow gradient through the containment sidewalls which must be maintained. In this case, however, the containment walls are to be constructed of high density polyethylene (HDPE) and this inflow component through the sidewalls is considered negligible.

Also typical to new containment type landfills is the need to pump excessive amounts of "leachate" until the inward gradient is established and relatively steady state conditions are achieved. In this particular case, Hardee County has been operating in essence a three sided containment system for some time and it is assumed that relatively steady state conditions have already been achieved and will exist when the total containment system is completed.

A summary of the projected leachate percolation and corresponding generation rates are summarized in Table 1. A graphical presentation of the projected total annual and maximum leachate generation rates by year over the life of the landfill is presented in Figure 1.

From Figure 1, it can be seen that the highest average and maximum leachate flows are approximately 5,300 gallons per day (gpd) and 23,100 gpd, respectively.

LEACHATE COLLECTION PUMP STATION

From specification Section 11210, it can be seen that the nominal capacity of the leachate collection pump station is 130 gallons per minutes (gpm) with one of the two pumps running. using the maximum projected leachate generation rate of 23,100 gpd, the pump would run about 180 minutes per day maximum.

LEACHATE STORAGE

Tank size

From specification Section 11200, it can be seen that the nominal usable capacity of the leachate storage tanks will be approximately 79,000 gallons each or 158,000 gallons total. Using the projected maximum leachate generation rate of 23,100 gpd, the minimum nominal usable storage capacity can be calculated to be about 7 days.

TRUCK LOADING PUMP STATION

From specification Section 11211, it can be seen that one of the two truck loading pumps will have a nominal capacity of about 600 gpm. Using the projected maximum leachate generation rate of 23,100 gpd, it can be calculated that about 40 minutes per day of pump operation will be required.

Truck pumps

Attachment 3
4/5

LEACHATE HAULING AND DISPOSAL

Hardee County hauls leachate from the truck loading facility using their own 5,000 gallon tanker truck. Using the maximum leachate generation rate of 23,100 gpd, it can be calculated that a maximum of 5 truck trips per day will be required.

Hardee County has an interlocal agreement with the City of Wauchula to discharge leachate to their wastewater system at a rate not to exceed 250 gpm. A copy of this interlocal agreement is included as Appendix B to this memorandum. Though not specifically stated in the interlocal agreement, we understand from County staff that the City has also established a maximum daily rate of leachate of 25,000 gpd. From Figure 1, it can be seen that the projected maximum month leachate generation is within the acceptance limit of the City of Wauchula wastewater system.

EXIST. WWTP CAPACITY

SEE LETTER from HARDEE CO REGARDING ADDITIONAL CAPACITY

c: Charles Hucks
Ken Lewis
File 07-172.06

G:\ENV\COMMON\W&WWATER\CRAIG\ME0821-1.DCF

Attachment 3
5/5
WWTP Capacities

Lindsey Kennelly

From: Joe O'Neill
Sent: Tuesday, January 20, 2004 3:41
To: Lindsey Kennelly
Subject: FW: requested information

-----Original Message-----
From: janice.williamson@hardeecounty.net [mailto:janice.williamson@hardeecounty.net]
Sent: Friday, August 29, 2003 4:04 PM
To: Joe O'Neill
Subject: requested information

In response to our phone conversation today:

Vandolah Waste Water Treatment Plant is a 50,000 gallon per day capacity plant. They currently service one commercial which utilizes a maximum of 25,000 gallons per day. Excess capacity which could be used for leachate treatment = 25,000 gallons per day

Wauchula Hills Waste Water Treatment Plant is currently approved and funded through phase one for a of 120,000 gallons per day capacity. (Final phase not funded this fiscal, but has a maximum capacity of 360,000 gpd) They currently estimate that phase one will include and estimated usage of 57,000 gpd which leaves potentially 63,000 gpd for the treatment of leachate. This plant should be on line no later than November 1, 2003.

In regards to the repair certification from CBI: I spoke with Dan Stone and he has the original letter with seal in his file and will overnight to me on Tuesday.

ATTACHMENT H-11

LEACHATE TRENCH CALCULATIONS

PRIMARY LEACHATE COLLECTION SYSTEM TRENCH CAPACITY CALCULATIONS

SCS ENGINEERS

SHEET ________ of ________

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Trench Capacity Calculations Open Cell Scenario w/ 2 Acres Active and 2 ft of Sand Leachate Collection & Removal System	LEK	1/27/2004
	CHECKED	DATE

Objective: Verify that the stone lined trenches can convey estimated leachate quantities.

CASE 1: Primary System (see HELP Model Summary)

Givens:

Flow/Acre =	1.1	gpm/acre = 1,584 gpd/acre
Flow =	3,168	gpd
Contributing Area =	2	acres (Remaining 8 acres are covered with a rain tarp)
Number of trenches open =	3	
Contributing Area per trench =	0.67	acres/trench
Trench Length =	433	ft
Trench Cross Sectional Area =	7.60	sf

Approach: Total Flow = Geonet Flow + Rock Flow = $Q_g + Q_r$

$Q_g = KiA$

K = permeability =	17.7	cm/sec (permeability for biplanar geocomposite)
i = hydraulic gradient =	0.24%	slope on trenches prior to waste placement
A = area =	0.176	sf (trench perimeter* net thick. = 7.03 ft x .30 inch)

$Q_g =$ 2.45E-04 cfs

0.015 cfm

OR

$Q_g = KiA = Ki(tW)$
$= Ki(tW)$
$= TiW$

t = geonet thickness =	0.30	inch
W = width of trench =	7.03	ft
T = transmissivity = Kt =	0.00135	m^2/s

$Q_g =$ 6.94E-06 m^3/sec

2.45E-04 cfs

0.015 cfm

Use the smallest, most conservative Q_g. $Q_g =$ 0.015 cfm

$Q_r = KiA$

K = permeability =	10	cm/sec (see Table 14.1, Attached)
i = hydraulic gradient =	0.0024	slope on trenches prior to waste placement
A = area =	7.60	sf

$Q_r =$ 5.98E-03 cfs

0.359 cfm

$Q_r =$ 0.359 cfm

Conclusion:

Total Flow Through the Rock and Geonet= 0.374 cfm

Trench Flow = HELP Model Flow * Contributing Area per Trench
= 1,056 gal/day/trench
= 141 cf/day/trench
= 0.098 cfm/trench

Total Q			HELP Model Q	
0.374	cfm	>	0.098	cfm

Trench flow exceeds the calculated maximum flow TRUE

SCS ENGINEERS			
		SHEET ________	of ________
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Trench Capacity Calculations Top of Intermediate Cover w/ 2 Acres Active and 2 ft of Sand Leachate Collection & Removal System	BY LEK	DATE 1/27/2004	
	CHECKED	DATE	

Objective: Verify that the stone lined trenches can convey estimated leachate quantities.

CASE 4

Primary System
See HELP model summary

Givens:

Flow/Acre =	0.93	gpm/acre = 1,339 gpd/acre
Flow =	2,678	gpd
Contributing Area =	2	acres (Remaining 8 acres are covered with a rain tarp)
Number of trenches open =	3	
Contributing Area per trench =	0.67	acres
Trench Length =	433	ft
Trench Cross Sectional Area =	7.60	sf

Approach: Total Flow = Geonet Flow + Rock Flow = $Q_g + Q_r$

$Q_g = KiA$

K = permeability =	6.8	cm/sec (permeability for biplanar geocomposite)
i = hydraulic gradient =	0.37%	slope on trenches after waste placement
A = area =	0.158	sf (trench perimeter* net thick. = 7.03 ft x .27 inch)

Q_g = 1.31E-04 cfs
0.008 cfm

OR

$Q_g = KiA = Ki(tW)$
$= Ki(tW)$
$= TiW$

t = geonet thickness =	0.27	inch
W = width of trench =	7.03	ft
T = transmissivity = Kt =	0.00047	m^2/s

Q_g = 3.70E-06 m^3/sec
1.31E-04 cfs
0.008 cfm

Use the smallest, most conservative Q_g. Q_g = 0.008 cfm

$Q_r = KiA$

K = permeability =	10	cm/sec (see Table 14.1, Attached)
i = hydraulic gradient =	0.0037	slope on trenches after waste placement
A = area =	7.60	sf

Q_r = 9.23E-03 cfs
0.554 cfm

Q_r = 0.554 cfm

Conclusion:

Total Flow Through the Rock and Geonet= 0.561 cfm

Trench Flow = HELP Model Flow * Contributing Area per Trench
= 893 gal/day/trench
= 119 cf/day/trench
= 0.083 cfm/trench

Total Q			HELP Model Q	
0.561	cfm	>	0.083	cfm

Trench flow exceeds the calculated maximum flow TRUE

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SECONDARY LEACHATE COLLECTION SYSTEM
TRENCH CAPACITY CALCULATIONS

SCS ENGINEERS

SHEET ________ of ________

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Trench Capacity Calculations	LEK	1/27/2004
Top of Intermediate Cover w/ 2 Acres Active and 2 ft of Sand Leak Detection System	CHECKED	DATE

Objective: Verify that the stone lined trenches can convey estimated leachate quantities.

Case 1: Secondary System
(see HELP Model Summary)

Givens:

Flow/Acre =	0.02	gpm/acre = 29 gpd/acre
Flow =	58	gpd
Contributing Area =	2	acres (Remaining 8 acres are covered with a rain tarp)
Number of trenches open =	3	
Contributing Area per trench =	0.67	acres
Trench Length =	433	ft
Trench Cross Sectional Area =	3.31	sf

Approach: Total Flow = Geonet Flow + Rock Flow = $Q_g + Q_r$

Q_g = KiA

K = permeability =	26.2	cm/sec (permeability for triplanar geocomposite)
i = hydraulic gradient =	0.24%	slope on trenches prior to waste placement
A = area =	0.149	sf (trench perimeter* net thick. = 4.10 ft x .30 inch)

Q_g = 3.08E-04 cfs
0.019 cfm

OR

Q_g = KiA = Ki(tW)
= Ki(tW)
= TiW

t = geonet thickness =	0.30	inch
W = width of trench =	5.98	ft
T = transmissivity = Kt =	0.00200	m^2/s

Q_g = 8.74E-06 m^3/sec
3.09E-04 cfs
0.019 cfm

Use the smallest, most conservative Q_g. Q_g = 0.019 cfm

Q_r = KiA

K = permeability =	10	cm/sec (see Table 14.1, Attached)
i = hydraulic gradient =	0.0024	slope on trenches prior to waste placement
A = area =	3.31	sf

Q_r = 2.61E-03 cfs
0.156 cfm

Q_r = 0.156 cfm

Conclusion:

Total Flow Through the Rock and Geonet = 0.175 cfm

Trench Flow = HELP Model Flow * Contributing Area per Trench
= 19 gal/day/trench
= 3 cf/day/trench
= 0.002 cfm/trench

Total Q			HELP Model Q	
0.175	cfm	>	0.002	cfm

Trench flow exceeds the calculated maximum flow TRUE

SCS ENGINEERS

SHEET ________ of ________

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Trench Capacity Calculations Top of Intermediate Cover w/ 2 Acres Active and 2 ft of Sand Leak Detection System	LEK	1/27/2004
	CHECKED	DATE

Objective: Verify that the stone lined trenches can convey estimated leachate quantities.

Case 4: Secondary System
(See HELP Model Summary)

Givens:

Flow/Acre = 0.04 gpm/acre = 58 gpd/acre
Flow = 115 gpd
Contributing Area = 2 acres (Remaining 8 acres are covered with a rain tarp)
Number of trenches open = 3
Contributing Area per trench = 0.67 acres
Trench Length = 433 ft
Trench Cross Sectional Area = 3.31 sf

Approach: Total Flow = Geonet Flow + Rock Flow = $Q_g + Q_r$

$Q_g = KiA$

K = permeability = 13.4 cm/sec (permeability for triplanar geocomposite)
i = hydraulic gradient = 0.37% slope on trenches after waste placement
A = area = 0.125 sf (trench perimeter* net thick. = 4.10 ft x ..25 inch)

Q_g = 2.03E-04 cfs
0.012 cfm

OR

$Q_g = KiA = Ki(tW)$
$= Ki(tW)$
$= TiW$

t = geonet thickness = 0.25 inch
W = width of trench = 5.98 ft
T = transmissivity = Kt = 0.00085 m^2/s

Q_g = 5.74E-06 m^3/sec
2.03E-04 cfs
0.012 cfm

Use the smallest, most conservative Q_g. Q_g = 0.012 cfm

$Q_r = KiA$

K = permeability = 10 cm/sec (see Table 14.1, Attached)
i = hydraulic gradient = 0.0037 slope on trenches after waste placement
A = area = 3.31 sf

Q_r = 4.02E-03 cfs
0.241 cfm

Q_r = 0.241 cfm

Conclusion:

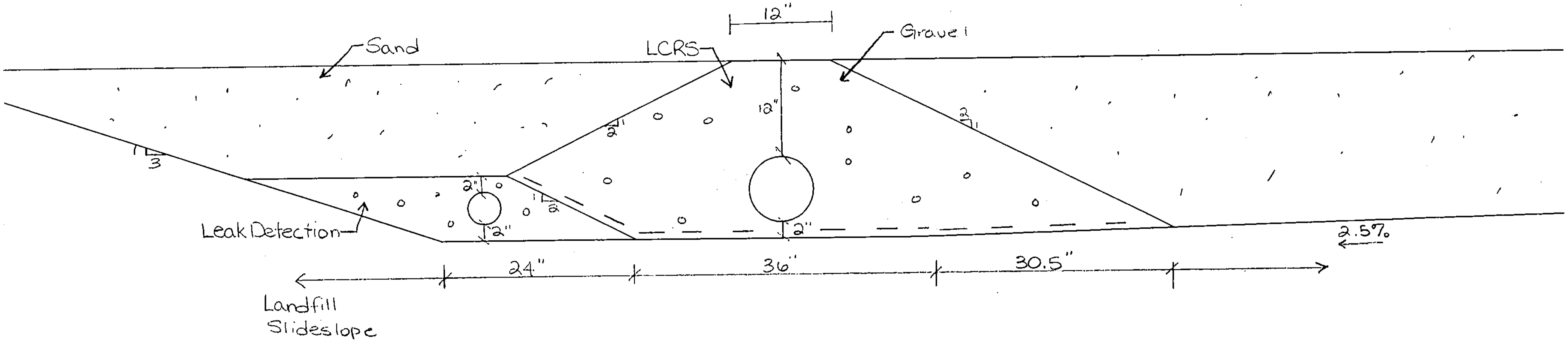
Total Flow Through the Rock and Geonet= 0.253 cfm

Trench Flow = HELP Model Flow * Contributing Area per Trench
= 38 gal/day/trench
= 5 cf/day/trench
= 0.004 cfm/trench

Total Q			HELP Model Q	
0.253	cfm	>	0.004	cfm

Trench flow exceeds the calculated maximum flow TRUE

LCRS TRENCH



LCRS Cross-Sectional Area = $1092 in^2 = 7.6 ft^2$

LCRS Trench Perimeter (as indicated by dashed line) = 84.4 in = 7.03 ft

Leak Detection Cross-Sectional Area = $224 in^2 = 1.56 ft^2$

Leak Detection Trench Perimeter (as indicated by dashed line) = 49.3 in = 4.10 ft

BEST AVAILABLE COPY

Table 14.1 Permeability and Drainage Characteristics of Soils*

	Coefficient of Permeability k (m/s)											
	10^0	10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}	10^{-8}	10^{-9}	10^{-10}	10^{-11}
Drainage	Good						Poor		Practically Impervious			
Soil types	Clean gravel		Clean sands, clean sand and gravel mixtures			Very fine sands, organic and inorganic silts, mixtures of sand silt and clay, glacial till, stratified clay deposits, etc.				"Impervious" soils, e.g., homogeneous clays below zone of weathering		
					"Impervious" soils modified by effects of vegetation and weathering							

*After Casagrande and Fadum (1940).

K, permeability of clean gravel = $10^{-1}\ \frac{\text{M}}{\text{S}} = 10\ \frac{\text{CM}}{\text{S}}$

and arrangement of the pores together determine the porosity. In stiff clays and shales, as well as in rocks, macropores produced by fissures, joints, and cracks exert a major influence on the permeability.

14.3 Permeability of Granular Soils

The permeability of granular soils depends mainly on the cross-sectional areas of the pore channels. Since the average diameter of the pores in a soil at a given porosity increases in proportion to the average grain size, the permeability of granular soils might be expected to increase as the square of some characteristic grain size, designated as the *effective grain size, D_e*. Extensive investigations of filter sands by Hazen (1892) led to the equation

$$k(\text{m/s}) = C_e D_e^2 \qquad (14.6)$$

in which the parameter C_e includes the effects of the shape of the pore channels in the direction of flow and of the total volume of pores as determined by such properties as grain shape and gradation. The effective grain size best fitting Eq. 14.6 was found by Hazen to be the 10% size D_{10} (Article 5). The permeability data in Fig. 14.3 approximate a straight line with a slope equal to 2, consistent with Eq. 14.6. These data indicate an average value of $C_{10} = 10^{-2}$ when k is expressed in m/s and D_{10} in mm. According to the data in Fig. 14.3, Eq. 14.6 may underestimate or overestimate the permeability of granular soils by a factor of about 2.

Laboratory studies by Kenney et al. (1984) on the permeability of granular filters, using natural sands and

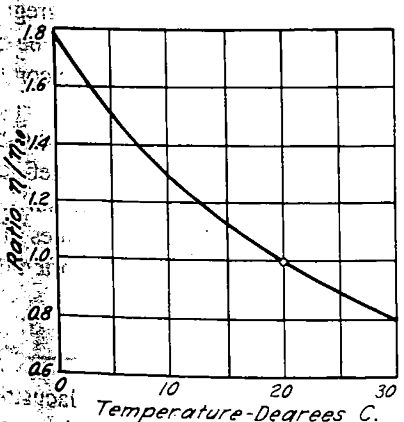


Figure 14.2 Relation between temperature and viscosity of water.

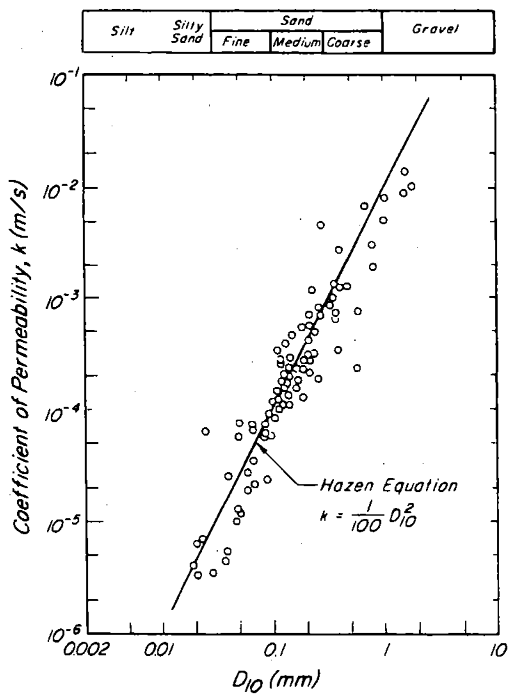


Figure 14.3 Hazen equation and data relating coefficient of permeability and effective grain size of granular soils (after Louden 1952).

Soil Mechanics In Engineering Practice
Third Edition
Terzaghi; Peck; Mesri

ATTACHMENT H-12

STORMWATER MANAGEMENT PERMITS

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
GENERAL
MANAGEMENT OF SURFACE WATER PERMIT

FILE OF RECORD
PERMIT NO. 407767.00

PERMIT GRANTED TO:	PERMIT NO:	407767.00
	PERMIT APPLICATION	
Hardee County	DATE FILED:	June 12, 1990
412 West Orange Street	DATE AMENDED:	
Wauchula, FL 33873	PERMIT GRANTED ON:	July 30, 1990
	PERMIT EXPIRES ON:	July 30, 1993
	PROJECT NAME:	Hardee County Solid Waste Recycle Center
	COUNTY:	Hardee
	LOCATION	
	SECTION	35
	TOWNSHIP	33S
	RANGE	25E

This permit is issued under the provisions of Chapter 373, Florida Statutes, Florida Administrative Code Rule(s) 40D-4 and 40D-40. The above-named permittee is hereby authorized to perform the work or operate the facility shown by the application and approved drawing(s), plans, and other documents, attached hereto or on file with the District and made a part hereof, and specifically described as follows:

Construction of a Surface Water Management System serving a 5.01 acre Government project as named above.

LIMITING CONDITIONS

1. The permittee shall perform the construction authorized in a manner so as to minimize any adverse impact of the system on fish, wildlife, natural environmental values, and water quality. The permittee shall institute necessary measures during the construction period, including full compaction of any fill material placed around newly installed structures, to reduce erosion, turbidity, nutrient loading and sedimentation in the receiving waters.

2. Water quality data for the water discharged from the permittee's property or into the surface waters of the state shall be submitted to the District as required. Parameters to be monitored may include those listed in Chapter 17-3. Analyses shall be performed according to procedures outlined in the current edition of Standard Methods for the Examination of Water and Wastewater by American Public Health Association of Methods for Chemical analyses of Water and Wastes by the U.S. Environmental Protection Agency. If water quality data are required, the permittee shall provide data as required on volumes of water discharged, including total volume discharged during the days of sampling and total monthly discharges from the property or into surface waters of the state.

3. The permittee shall comply with all applicable local subdivision regulations and other local requirements. In addition the permittee shall obtain all necessary Federal, State, local and special district authorizations prior to the start of any construction or alteration of works authorized by this permit.

4. The operation phase of this permit shall not become effective until the owner or his authorized agent certifies that all facilities have been constructed in accordance with the design permitted by the District. Within 30 days after completion of construction of the surface water management system, the permittee shall submit the certification and notify the District that the facilities are complete. Upon completion of the surface water management system, the permittee shall request transfer of the permit to the responsible entity approved by the District. The District may inspect the system and require remedial measures as a condition of transfer of the permit.

5. All roads shall be set at or above elevations required by the applicable local governmental flood criteria.

6. All building floors shall be set at or above elevations acceptable to the applicable local government.

7. Off-site discharges during construction and development shall be made only through the facilities authorized by this permit. Water discharged from the project shall be through structures having a mechanism suitable for regulating upstream stages. Stages may be subject to operating schedules satisfactory to the District.

8. No construction authorized herein shall commence until a responsible entity acceptable to the District has been established and has agreed to operate and maintain the system. The entity must be provided with sufficient ownership so that it has control over all water management facilities authorized herein. Upon receipt of written evidence of the satisfaction of this condition, the District will issue an authorization to commence construction.

9. The permit does not convey to the permittee any property right nor any rights or privileges other than those specified in the permit and Chapter 40D-4.

10. The permittee shall hold and save the District harmless from any and all damages, claims, or liabilities which may arise by reason of the construction operation, maintenance or use of any facility authorized by the permit.

11. This permit is issued based on the applicant's submitted information which reasonably demonstrates the adverse off-site water resource related impacts will not be caused by the completed permit activity. It is also the responsibility of the permittee to insure that adverse off-site water resource related impacts do not occur during construction.

12. Prior to dewatering, plans shall be submitted to the District for approval. Information shall include as a minimum; pump sizes, locations and hours of operation for each pump. If off-site discharge is proposed, or off-site adverse impacts are evident, an individual water use permit may be required. The permittee is cautioned that several months may be required for consideration of the water use permit application. Temporary dewatering during construction, i.e., well pointing, ditching, etc. that will not affect adjacent wetlands or off-site lands is exempt from this requirement.

STANDARD CONDITIONS

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Chapters 373 and 403, Florida Statutes. The permittee is hereby placed on notice that the District will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the District.

3. The issuance of this permit does not convey any vested rights or any exclusive privileges. Nor does it authorize any injury to public or private property or any invasion of personal rights, nor infringement of federal, state or local laws or regulations. This permit does not constitute a waiver of or approval of any other District and Department of Environmental Regulation permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute state recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the state. Only the Trustees of the Internal Improvement Trust Fund may express state opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, plant or aquatic life or property and penalties therefore caused by the construction or operation of the permitted system, nor does it allow the permittee to cause pollution in contravention of Florida Statutes and District and Department of Environmental Regulation rules, unless specifically authorized by any order from the District or Department.

6. The permittee shall at all times properly operate and maintain the systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with conditions of this permit, as required by District rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by District rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized District personnel, upon presentation of credentials or other documents as may be required by law, access to the premises, at reasonable times, where the permitted activity is located or conducted; for the purposes of inspection and testing to determine compliance with this permit and District regulations, such as:

   a. Having access to and copying any records that must be kept under the conditions of the permit;

b. Inspecting the facility, equipment, practices, or operations regulated or required under this permit;
c. Sampling or monitoring any substances or parameters at any location reasonably necessary to assure compliance with this permit or District rules; and
d. Gathering of data and information.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately notify and provide the District with the following information:

   a. A description of and cause of non-compliance; and
   b. the period of non-compliance, including exact dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

   The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the District for penalties or revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source, which are submitted to the District, may be used by the District as evidence in any enforcement case arising under the Florida Statutes or District rules, except where such use is proscribed by Florida Statutes.

10. The permittee agrees to comply with changes in District rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or District rules.

11. This permit is transferable only upon District approval in accordance with Florida Administrative Code rules 40D-4.351 as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the District.

12. When requested by the District, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the District, such facts or information shall be submitted or corrected promptly.

13. Drawings, plans, calculations, specifications or other information submitted by the permittee, not attached hereto, but retained on file at the Distric office, are made a part of this permit.

14. A copy of this permit and a set of construction drawings depicting the permitted system are required to be kept at the work site of the permitted activity during the entire period of construction or operation. The approved construction drawings are issued as a part of this permit.

15. The discharges from this system shall meet state water quality standards as set forth in Chapter 17-3 and Rule 17-4.242 for class waters equivalent to the receiving waters.

16. Any water discharged from the site during construction of the project shall meet State water quality standards at the property boundary or point of discharge to wetlands or State waters. If the discharge does not meet these standards, the discharge will be immediately stopped and the District shall be notified of corrective action taken to correct the violation. Turbidity shall not exceed 29 N.T.U. above background level. Turbidity shall be monitored at least daily during discharge, or more often as determined by the project engineer if needed, to ensure compliance.

17. The permittee and construction representatives shall assure that erosion and sediment control measures as necessary and as required by Rule 40D-4.091 shall be effectively implemented continuously from beginning of project construction until completion to prevent erosion and transport and discharge of sediment to wetlands or any property other than the project area. Project detention/retention ponds and discharge control structures which are to be constructed as part of the project shall be initially built and maintained continuously during project construction to avoid adverse impact to receiving waters or off site.

18. Except as authorized by this Permit, any further land development, wetlands disturbance or other construction within the total land area of this site will require additional permitting in accordance with Chapters 40D-4 and 40D-40, F.A.C.

19. All rights-of-way and easement locations necessary to construct, operate and maintain all facilities, including uplands conservation/buffer areas and wetlands, which constitute the permitted surface water management system shall be reserved for water management purposes. Prior to site occupancy the reserved areas shall be shown on any final subdivision plat and recorded in the county public records as special use areas for dedication to the responsible operation and maintenance entity.

20. Construction of the discharge control and water quality treatment facilities which are part of the permitted surface water management system shall be completed and operational prior to beneficial occupancy and use of the project development being served.

21. Any existing wells in the path of construction shall be properly plugged and abandoned by a licensed water well contractor in accordance with Chapter 40D-3 and Rule 17-21.10(4), F.A.C.

22. Any existing septic tanks on this site shall be abandoned at the beginning of the project construction in accordance with Rule 10D-6.53, F.A.C.

23. Any existing fuel storage tanks and fuel pumps on this site shall be removed at the beginning of project construction in accordance with Rule 17 61.05-(3)(c), F.A.C.

24. All retention/detention pond side slopes, except over filter media, shall be sodded, and staked as necessary, to prevent erosion. Filter media surfaces shall also be stabilized to prevent erosion, but in a manner that does not

25. By issuance of this permit the District, its employees and representatives assume no responsibility and/or liability in regard to either the design, construction or performance of the permitted facilities.

26. Any system alteration, including for augmentation into or withdrawal of water from the permitted system, other than as specifically authorized by this permit will require additional District permitting consideration. The water level of retention and detention ponds shall not be augmented by pumping or diversion of water into the ponds to artificially control their level above the design normal or beginning storage level. Wells and diversion facilities for such augmentation may require water use permitting according to Chapter 40D-2, F.A.C.

27. Information and reports required to be submitted by this permit shall be submitted to:

    Permits Data Group
    Southwest Florida Water Management District
    2379 Broad Street
    Brooksville, Florida 34609-6899

28. Construction of all water management facilities, including wetlands compensation, grading, mulching, planting of mitigation areas, etc. must be completed prior to beneficial occupancy of the project or operation of the surface water management system.

29. The excavation of retention/detention ponds is limited to the permitted design elevation(s).

<u>TRACKING CONDITIONS</u>

1. The permittee shall immediately provide written notification to the District upon beginning any construction authorized by this permit.

2. The applicant shall retain the Design Engineer, or other Professional Engineer registered in Florida, to conduct on-site observations of construction and assist with the as-built certification requirements of this project; the permittee shall inform the District in writing and prior to beginning construction of the name, address and phone number of the Professional Engineer so employed by the applicant/permittee for that purpose.

3. The Operation and Maintenance Entity shall submit inspection reports in the form required by the District, in accordance with the following schedule unless specified otherwise herein or in Application Information.

    a. For systems utilizing retention, the inspections shall be performed two (2) years after operation is authorized and every two (2) years thereafter.

4. Refer to <u>LIMITING CONDITION</u> No. 4 herein.

SPECIFIC CONDITIONS

1. All surface water management systems shall practice water conservation to maintain environmental quality and resource protection; to increase the efficiency of transport, application and use; to decrease waste; to minimize unnatural runoff from the property and to minimize dewatering of off-site property. At such time in the future as the Governing Board establishes minimum water levels in aquifers or minimum rates of flow in streams, or otherwise adopts specific conservation criteria, the permittee may be required to undergo an alteration of the system to comply with such criteria upon notice by the District and after a reasonable period for permitting compliance.

2. Wetland boundaries and buffer areas shall be clearly delineated on the site prior to initial clearing and grading activities. The delineation shall endure throughout the construction period and be readily discernible to construction personnel.

3. Any further activities beyond the permitted limits of construction, particularly in the vicinity of wetlands, will require prior surface water permitting under Chapter 40D-4/40, Florida Administrative Code.

Robert M. Viertel

Authorized Signature
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
MANAGEMENT AND STORAGE OF SURFACE WATER
GENERAL - CONSTRUCTION
PERMIT NO. 407767.01

EXPIRATION DATE: October 6, 1995

PERMIT ISSUE DATE: October 6, 1992

This permit, issued under the provisions of Chapter 373, Florida Statutes, Florida Administrative Code Rules 40D-4 and 40D-40 authorizes the permittee to perform the work outlined herein and shown by the application, approved drawing(s), plans, and other documents, attached hereto and kept on file at the District:

PROJECT NAME: Hardee County Solid Waste Recycling Center

GRANTED TO: Hardee County Solid Waste Recycling Center
P.O. Box 246
Wauchula, FL 33873

ABSTRACT: This permit is for the construction of a new surface water management system to serve a 0.9 acre project as named above and as shown on the approved construction plans. The proposed drainage system is designed to maintain the pre-development peak discharge rate for a 25-year, 24-hour storm event. Water quality treatment will be provided through an on-line retention system.

OP. & MAINT. ENTITY: Hardee County Solid Waste Recycling Center

PROPERTY LOCATION: Hardee

SEC/TWP/RGE: 35/33S/25E

TOTAL ACRES OWNED: 5.1

PROJECT SIZE: 0.9

LAND USE: Government

DATE APPLICATION FILED: April 9, 1992

AMENDED DATE: July 8, 1992

1. Water Quantity/Quality

POND #	AREA @ T.O.B.	TREATMENT TYPE
B-E	0.34	Retention
B-W	0.20	Retention
TOTAL	0.54	

FILE OF RECORD
PERMIT NO. —— 0n6
FILED ON 11-6-92 BY Cyo

II. 100-Year Floodplain

Encroachment (ac-ft):	Compensation (ac-ft):
0.00	0.00

III. Environmental Considerations

No wetlands or other distinct hydrologic features exist within the project area.

SPECIFIC CONDITIONS

1. All surface water management systems shall practice water conservation to maintain environmental quality and resource protection; to increase the efficiency of transport, application and use; to decrease waste; to minimize unnatural runoff from the property and to minimize dewatering of off-site property. At such time in the future as the Governing Board establishes minimum water levels in aquifers or minimum rates of flow in streams, or otherwise adopts specific conservation criteria, the permittee may be required to undergo an alteration of the system to comply with such criteria upon notice by the District and after a reasonable period for permitting compliance.

2. In order to ensure that the person who will construct the proposed work is identified as required by 373.413(2)(f), Florida Statutes, once the contract is awarded, the name, address, and telephone number of the contractor will be submitted to the District prior to construction referencing General Permit Number 407767.01.

3. This permit is for a single phase (i.e., full construction buildout) as regards the stormwater management system.

TRACKING CONDITIONS

1. The permittee shall immediately provide written notification to the District upon beginning any construction authorized by this permit.

2. The applicant shall retain the Design Engineer, or other Professional Engineer registered in Florida, to conduct on-site observations of construction and assist with the as-built certification requirements of this project; the permittee shall inform the District in writing and prior to beginning construction of the name, address and phone number of the Professional Engineer so employed by the applicant/permittee for that purpose.

3. The Operation and Maintenance Entity shall submit inspection reports in the form required by the District, in accordance with the following schedule unless specified otherwise herein or in Application Information.

Permit No. 407767.01
Project Name: Hardee County Solid Waste Recycling Center
Page 3

( ) For systems utilizing effluent filtration or exfiltration, the inspections shall be performed 18 months after operation is authorized and every 18 months thereafter.

(X) For systems utilizing retention and wet detention, the inspections shall be performed two years after operation is authorized and every two years thereafter.

( ) For systems utilizing effluent filtration or exfiltration and retention and wet detention, the inspections shall be performed 18 months after operation is authorized and every 18 months thereafter.

LIMITING AND STANDARD CONDITIONS

1. The Permittee shall comply with the attached Limiting and Standard Conditions which are attached hereto, incorporated herein by reference as Exhibits "A" and "B" respectively and made a part hereof.

Robert M. Vierted 10/6/92
Authorized Signature

Rev 1/92

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EXHIBIT "A"

1. The permittee shall perform the construction authorized in a manner so as to minimize any adverse impact of the system on fish, wildlife, natural environmental values, and water quality. The permittee shall institute necessary measures during the construction period, including full compaction of any fill material placed around newly installed structures, to reduce erosion, turbidity, nutrient loading and sedimentation in the receiving waters.

2. Water quality data for the water discharged from the permittee's property or into the surface waters of the state shall be submitted to the District as required. Parameters to be monitored may include those listed in Chapter 17-3. Analyses shall be performed according to procedures outlined in the current edition of Standard Methods for the Examination of Water and Wastewater by American Public Health Association of Methods for Chemical analyses of Water and Wastes by the U.S. Environmental Protection Agency. If water quality data are required, the permittee shall provide data as required on volumes of water discharged, including total volume discharged during the days of sampling and total monthly discharges from the property or into surface waters of the state.

3. The permittee shall comply with all applicable local subdivision regulations and other local requirements. In addition the permittee shall obtain all necessary Federal, State, local and special district authorizations prior to the start of any construction or alteration of works authorized by this permit.

4. The operation phase of this permit shall not become effective until the owner or his authorized agent certifies that all facilities have been constructed in accordance with the design permitted by the District. Within 30 days after completion of construction of the surface water management system, the permittee shall submit the certification and notify the District that the facilities are complete. Upon completion of the surface water management system, the permittee shall request transfer of the permit to the responsible entity approved by the District. The District may inspect the system and require remedial measures as a condition of transfer of the permit.

5. All roads shall be set at or above elevations required by the applicable local governmental flood criteria.

6. All building floors shall be set at or above elevations acceptable to the applicable local government.

7. Off-site discharges during construction and development shall be made only through the facilities authorized by this permit. Water discharged from the project shall be through structures having a mechanism suitable for regulating upstream stages. Stages may be subject to operating schedules satisfactory to the District.

8. No construction authorized herein shall commence until a responsible entity acceptable to the District has been established and has agreed to operate and maintain the system. The entity must be provided with sufficient ownership so that it has control over all water management facilities authorized herein. Upon receipt of written evidence of the satisfaction of this condition, the District will issue an authorization to commence construction.

9. The permit does not convey to the permittee any property right nor any rights or privileges other than those specified in the permit and Chapter 40D-4.

10. The permittee shall hold and save the District harmless from any and all damages, claims, or liabilities which may arise by reason of the construction operation, maintenance or use of any facility authorized by the permit.

11. This permit is issued based on the applicant's submitted information which reasonably demonstrates the adverse off-site water resource related impacts will not be caused by the completed permit activity. It is also the responsibility of the permittee to insure that adverse off-site water resource related impacts do not occur during construction.

12. Prior to dewatering, plans shall be submitted to the District for approval. Information shall include as a minimum; pump sizes, locations and hours of operation for each pump. If off-site discharge is proposed, or off-site adverse impacts are evident, an individual water use permit may be required. The permittee is cautioned that several months may be required for consideration of the water use permit application. Temporary dewatering during construction, i.e., well pointing, ditching, etc. that will not affect adjacent wetlands or off-site lands is exempt from this requirement.

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EXHIBIT "B"

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Chapters 373 and 403, Florida Statutes. The permittee is hereby placed on notice that the District will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the District.

3. The issuance of this permit does not convey any vested rights or any exclusive privileges. Nor does it authorize any injury to public or private property or any invasion of personal rights, nor infringement of federal, state or local laws or regulations. This permit does not constitute a waiver of or approval of any other District and Department of Environmental Regulation permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute state recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the state. Only the Trustees of the Internal Improvement Trust Fund may express state opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, plant or aquatic life or property and penalties therefore caused by the construction or operation of the permitted system, nor does it allow the permittee to cause pollution in contravention of Florida Statutes and District and Department of Environmental Regulation rules, unless specifically authorized by any order from the District or Department.

6. The permittee shall at all times p... ly operate and maintain the systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with conditions of this permit, as required by District rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by District rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized District personnel, upon presentation of credentials or other documents as may be required by law, access to the premises, at reasonable times, where the permitted activity is located or conducted; for the purposes of inspection and testing to determine compliance with this permit and District regulations, such as:

   a. Having access to and copying any records that must be kept under the conditions of the permit;
   b. Inspecting the facility, equipment, practices, or operations regulated or required under this permit;
   c. Sampling or monitoring any substances or parameters at any location reasonably necessary to a... ure compliance with this permit or District rules; and

d. Gathering of [illegible]a and information.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately notify and provide the District with the following information:

   a. A description of and cause of non-compliance; and
   b. the period of non-compliance, including exact dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

   The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the District for penalties or revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source, which are submitted to the District, may be used by the District as evidence in any enforcement case arising under the Florida Statutes or District rules, except where such use is proscribed by Florida Statutes.

10. The permittee agrees to comply with changes in District rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or District rules.

11. This permit is transferable only upon District approval in accordance with Florida Administrative Code rules 40D-4.351 as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the District.

12. When specifically required as terms of permitting the permittee shall comply with the following monitoring and record keeping requirements:

   a. Upon request, the permittee shall furnish all records and plans required under District rules. The retention period for all records will be extended automatically, unless otherwise stipulated by the District, during the course of any unresolved enforcement action.
   b. The permittee shall retain, at the facility or other location designated by this permit, records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be at least three years from the date of the sample, measurement, report or application unless otherwise specified by District rule.
   c. Records of monitoring information shall include:
      - the date, exact place, and time of sampling or measurements;
      - the person responsible for performing the sampling or measurements;
      - the date(s) analyses were performed;
      - the person responsible for performing the analyses;
      - the analytical techniques or methods used; and
      - the results of such analyses.

13. When requested by the District, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the District, such facts or information shall be submitted or corrected promptly.

14. Drawings, plans, calculations, specifications or other information submitted by the permittee, not attached hereto, but retained on file at the District office, are made a part of this permit.

15. A copy of this permit and a set of construction drawings depicting the permitted system are required to be kept at the work site of the permitted activity during the entire period of construction or operation. The approved construction drawings are issued as a part of this permit.

16. The discharges from this system shall meet state water quality standards as set forth in Chapter 17-3 and Rule 17-4.242 for class waters equivalent to the receiving waters.

17. Any water discharged from the site during construction of the project shall meet State water quality standards at the property boundary or point of discharge to wetlands or State waters. If the discharge does not meet these standards, the discharge will be immediately stopped and the District shall be notified of corrective action taken to correct the violation. Turbidity shall not exceed 29 N.T.U. above background level. Turbidity shall be monitored at least daily during discharge, or more often as determined by the project engineer if needed, to ensure compliance.

18. The permittee and construction representatives shall assure that erosion and sediment control measures as necessary and as required by Rule 40D-4.091 shall be effectively implemented continuously from beginning of project construction until completion to prevent erosion and transport and discharge of sediment to wetlands or any property other than the project area. Project detention/retention ponds and discharge control structures which are to be constructed as part of the project shall be initially built and maintained continuously during project construction to avoid adverse impact to receiving waters or off site.

19. Except as authorized by this Permit, any further land development, wetlands disturbance or other construction within the total land area of this site will require additional permitting in accordance with Chapters 40D-4 and 40D-40, F.A.C.

20. All rights-of-way and easement locations necessary to construct, operate and maintain all facilities, including uplands conservation/buffer areas and wetlands, which constitute the permitted surface water management system shall be reserved for water management purposes. Prior to site occupancy the reserved areas shall be shown on any final subdivision plat and recorded in the county public records as special use areas for dedication to the responsible operation and maintenance entity.

21. Construction of the discharge control and water quality treatment facilities which are part of the permitted surface water management system shall be completed and operational prior to beneficial occupancy and use of the project development being served.

22. Establishment and survival of littoral areas provided for stormwater quality treatment in wet detention systems shall be assured by proper and continuing

maintenance procedures designed to promote viable wetlands plant growth of natural diversity and character. Certified as-built drawings depicting the established wet detention treatment areas shall be submitted to the District for inspection and approval upon completion of construction. Following as-built approval, perpetual maintenance shall be provided for the permitted system.

23. Any existing wells in the path of construction shall be properly plugged and abandoned by a licensed water well contractor in accordance with Chapter 40D-3 and Rule 17-21.10(4), F.A.C.

24. Any existing septic tanks on this site shall be abandoned at the beginning of the project construction in accordance with Rule 10D-6.53, F.A.C.

25. Any existing fuel storage tanks and fuel pumps on this site shall be removed at the beginning of project construction in accordance with Rule 17-61.05(3)(c), F.A.C.

26. All retention/detention pond side slopes, except over filter media, shall be sodded, and staked as necessary, to prevent erosion. Filter media surfaces shall also be stabilized to prevent erosion, but in a manner that does not restrict infiltration.

27. By issuance of this permit the District, its employees and representatives assume no responsibility and/or liability in regard to either the design, construction or performance of the permitted facilities.

28. Any system alteration, including for augmentation into or withdrawal of water from the permitted system, other than as specifically authorized by this permit will require additional District permitting consideration. The water level of retention and detention ponds shall not be augmented by pumping or diversion of water into the ponds to artificially control their level above the design normal or beginning storage level. Wells and diversion facilities for such augmentation may require water use permitting according to Chapter 40D-2, F.A.C.

29. Information and reports required to be submitted by this permit shall be submitted to:

 Permits Data Group
 Southwest Florida Water Management District
 2379 Broad Street
 Brooksville, Florida 34609-6899

30. Construction of all water management facilities, including wetlands compensation, grading, mulching, planting of mitigation areas, etc. must be completed prior to beneficial occupancy of the project or operation of the surface water management system.

31. The excavation of retention/detention ponds is limited to the permitted design elevation(s).

32. The permittee shall notify the District within 30 days of the sale or transfer of ownership of land on which a surface water management system will be or is located, and request transfer of the permit to the new owner. A surface water management permit to construct or alter a system can be transferred if the new permittee agrees to the transfer and the permit has not expired. The District can transfer the operation phase permit provided the project has been properly completed, the new permittee meets the rule requirements for operation and maintenance entities and the land use remains the same.

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
MANAGEMENT AND STORAGE OF SURFACE WATER
GENERAL - CONSTRUCTION
PERMIT NO. 407767.01

EXPIRATION DATE: October 6, 1995	PERMIT ISSUE DATE: October 6, 1992

This permit, issued under the provisions of Chapter 373, Florida Statutes, Florida Administrative Code Rules 40D-4 and 40D-40 authorizes the permittee to perform the work outlined herein and shown by the application, approved drawing(s), plans, and other documents, attached hereto and kept on file at the District:

PROJECT NAME: Hardee County Solid Waste Recycling Center

GRANTED TO: Hardee County Solid Waste Recycling Center
P.O. Box 246
Wauchula, FL 33873

ABSTRACT: This permit is for the construction of a new surface water management system to serve a 0.9 acre project as named above and as shown on the approved construction plans. The proposed drainage system is designed to maintain the pre-development peak discharge rate for a 25-year, 24-hour storm event. Water quality treatment will be provided through an on-line retention system.

OP. & MAINT. ENTITY: Hardee County Solid Waste Recycling Center

PROPERTY LOCATION: Hardee

SEC/TWP/RGE: 35/33S/25E

TOTAL ACRES OWNED: 5.1

PROJECT SIZE: 0.9

LAND USE: Government

DATE APPLICATION FILED: April 9, 1992

AMENDED DATE: July 8, 1992

I. Water Quantity/Quality

POND #	AREA @ T.O.B.	TREATMENT TYPE
B-E	0.34	Retention
B-W	0.20	Retention
TOTAL	0.54	

FILE OF RECORD
PERMIT NO. ---- 0nG

FILED ON 11-6-92 BY Cyo

II. 100-Year Floodplain

Encroachment (ac-ft):	Compensation (ac-ft):
0.00	0.00

III. Environmental Considerations

No wetlands or other distinct hydrologic features exist within the project area.

SPECIFIC CONDITIONS

1. All surface water management systems shall practice water conservation to maintain environmental quality and resource protection; to increase the efficiency of transport, application and use; to decrease waste; to minimize unnatural runoff from the property and to minimize dewatering of off-site property. At such time in the future as the Governing Board establishes minimum water levels in aquifers or minimum rates of flow in streams, or otherwise adopts specific conservation criteria, the permittee may be required to undergo an alteration of the system to comply with such criteria upon notice by the District and after a reasonable period for permitting compliance.

2. In order to ensure that the person who will construct the proposed work is identified as required by 373.413(2)(f), Florida Statutes, once the contract is awarded, the name, address, and telephone number of the contractor will be submitted to the District prior to construction referencing General Permit Number 407767.01.

3. This permit is for a single phase (i.e., full construction buildout) as regards the stormwater management system.

TRACKING CONDITIONS

1. The permittee shall immediately provide written notification to the District upon beginning any construction authorized by this permit.

2. The applicant shall retain the Design Engineer, or other Professional Engineer registered in Florida, to conduct on-site observations of construction and assist with the as-built certification requirements of this project; the permittee shall inform the District in writing and prior to beginning construction of the name, address and phone number of the Professional Engineer so employed by the applicant/permittee for that purpose.

3. The Operation and Maintenance Entity shall submit inspection reports in the form required by the District, in accordance with the following schedule unless specified otherwise herein or in Application Information.

( ) For systems utilizing effluent filtration or exfiltration, the inspections shall be performed 18 months after operation is authorized and every 18 months thereafter.

(X) For systems utilizing retention and wet detention, the inspections shall be performed two years after operation is authorized and every two years thereafter.

( ) For systems utilizing effluent filtration or exfiltration and retention and wet detention, the inspections shall be performed 18 months after operation is authorized and every 18 months thereafter.

LIMITING AND STANDARD CONDITIONS

1. The Permittee shall comply with the attached Limiting and Standard Conditions which are attached hereto, incorporated herein by reference as Exhibits "A" and "B" respectively and made a part hereof.

Robert M. Vierte 10/6/92
Authorized Signature

EXHIBIT "A"

1. The permittee shall perform the construction authorized in a manner so as to minimize any adverse impact of the system on fish, wildlife, natural environmental values, and water quality. The permittee shall institute necessary measures during the construction period, including full compaction of any fill material placed around newly installed structures, to reduce erosion, turbidity, nutrient loading and sedimentation in the receiving waters.

2. Water quality data for the water discharged from the permittee's property or into the surface waters of the state shall be submitted to the District as required. Parameters to be monitored may include those listed in Chapter 17-3. Analyses shall be performed according to procedures outlined in the current edition of Standard Methods for the Examination of Water and Wastewater by American Public Health Association of Methods for Chemical analyses of Water and Wastes by the U.S. Environmental Protection Agency. If water quality data are required, the permittee shall provide data as required on volumes of water discharged, including total volume discharged during the days of sampling and total monthly discharges from the property or into surface waters of the state.

3. The permittee shall comply with all applicable local subdivision regulations and other local requirements. In addition the permittee shall obtain all necessary Federal, State, local and special district authorizations prior to the start of any construction or alteration of works authorized by this permit.

4. The operation phase of this permit shall not become effective until the owner or his authorized agent certifies that all facilities have been constructed in accordance with the design permitted by the District. Within 30 days after completion of construction of the surface water management system, the permittee shall submit the certification and notify the District that the facilities are complete. Upon completion of the surface water management system, the permittee shall request transfer of the permit to the responsible entity approved by the District. The District may inspect the system and require remedial measures as a condition of transfer of the permit.

5. All roads shall be set at or above elevations required by the applicable local governmental flood criteria.

6. All building floors shall be set at or above elevations acceptable to the applicable local government.

7. Off-site discharges during construction and development shall be made only through the facilities authorized by this permit. Water discharged from the project shall be through structures having a mechanism suitable for regulating upstream stages. Stages may be subject to operating schedules satisfactory to the District.

8. No construction authorized herein shall commence until a responsible entity acceptable to the District has been established and has agreed to operate and maintain the system. The entity must be provided with sufficient ownership so that it has control over all water management facilities authorized herein. Upon receipt of written evidence of the satisfaction of 'his condition, the District will issue an authorization to commence construction.

9. The permit does not convey to the permittee any property right nor any rights or privileges other than those specified in the permit and Chapter 40D-4.

10. The permittee shall hold and save the District harmless from any and all damages, claims, or liabilities which may arise by reason of the construction operation, maintenance or use of any facility authorized by the permit.

11. This permit is issued based on the applicant's submitted information which reasonably demonstrates the adverse off-site water resource related impacts will not be caused by the completed permit activity. It is also the responsibility of the permittee to insure that adverse off-site water resource related impacts do not occur during construction.

12. Prior to dewatering, plans shall be submitted to the District for approval. Information shall include as a minimum; pump sizes, locations and hours of operation for each pump. If off-site discharge is proposed, or off-site adverse impacts are evident, an individual water use permit may be required. The permittee is cautioned that several months may be required for consideration of the water use permit application. Temporary dewatering during construction, i.e., well pointing, ditching, etc. that will not affect adjacent wetlands or off-site lands is exempt from this requirement.

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EXHIBIT "B"

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Chapters 373 and 403, Florida Statutes. The permittee is hereby placed on notice that the District will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the District.

3. The issuance of this permit does not convey any vested rights or any exclusive privileges. Nor does it authorize any injury to public or private property or any invasion of personal rights, nor infringement of federal, state or local laws or regulations. This permit does not constitute a waiver of or approval of any other District and Department of Environmental Regulation permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute state recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the state. Only the Trustees of the Internal Improvement Trust Fund may express state opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, plant or aquatic life or property and penalties therefore caused by the construction or operation of the permitted system, nor does it allow the permittee to cause pollution in contravention of Florida Statutes and District and Department of Environmental Regulation rules, unless specifically authorized by any order from the District or Department.

6. The permittee shall at all times properly operate and maintain the systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with conditions of this permit, as required by District rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by District rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized District personnel, upon presentation of credentials or other documents as may be required by law, access to the premises, at reasonable times, where the permitted activity is located or conducted; for the purposes of inspection and testing to determine compliance with this permit and District regulations, such as:

   a. Having access to and copying any records that must be kept under the conditions of the permit;
   b. Inspecting the facility, equipment, practices, or operations regulated or required under this permit;
   c. Sampling or monitoring any substances or parameters at any location reasonably necessary to assure compliance with this permit or District rules; and

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d. Gathering of [illegible]a and information.

Reasonable time may depend on the nature of the concern being investigated.

If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately notify and provide the District with the following information:

a. A description of and cause of non-compliance; and
b. the period of non-compliance, including exact dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the District for penalties or revocation of this permit.

In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source, which are submitted to the District, may be used by the District as evidence in any enforcement case arising under the Florida Statutes or District rules, except where such use is proscribed by Florida Statutes.

0. The permittee agrees to comply with changes in District rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or District rules.

1. This permit is transferable only upon District approval in accordance with Florida Administrative Code rules 40D-4.351 as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the District.

2. When specifically required as terms of permitting the permittee shall comply with the following monitoring and record keeping requirements:

a. Upon request, the permittee shall furnish all records and plans required under District rules. The retention period for all records will be extended automatically, unless otherwise stipulated by the District, during the course of any unresolved enforcement action.
b. The permittee shall retain, at the facility or other location designated by this permit, records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be at least three years from the date of the sample, measurement, report or application unless otherwise specified by District rule.
c. Records of monitoring information shall include:
   - the date, exact place, and time of sampling or measurements;
   - the person responsible for performing the sampling or measurements;
   - the date(s) analyses were performed;
   - the person responsible for performing the analyses;
   - the analytical techniques or methods used; and
   - the results of such analyses.

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13. When requested by the District, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the District, such facts or information shall be submitted or corrected promptly.

14. Drawings, plans, calculations, specifications or other information submitted by the permittee, not attached hereto, but retained on file at the District office, are made a part of this permit.

15. A copy of this permit and a set of construction drawings depicting the permitted system are required to be kept at the work site of the permitted activity during the entire period of construction or operation. The approved construction drawings are issued as a part of this permit.

16. The discharges from this system shall meet state water quality standards as set forth in Chapter 17-3 and Rule 17-4.242 for class waters equivalent to the receiving waters.

17. Any water discharged from the site during construction of the project shall meet State water quality standards at the property boundary or point of discharge to wetlands or State waters. If the discharge does not meet these standards, the discharge will be immediately stopped and the District shall be notified of corrective action taken to correct the violation. Turbidity shall not exceed 29 N.T.U. above background level. Turbidity shall be monitored at least daily during discharge, or more often as determined by the project engineer if needed, to ensure compliance.

18. The permittee and construction representatives shall assure that erosion and sediment control measures as necessary and as required by Rule 40D-4.091 shall be effectively implemented continuously from beginning of project construction until completion to prevent erosion and transport and discharge of sediment to wetlands or any property other than the project area. Project detention/retention ponds and discharge control structures which are to be constructed as part of the project shall be initially built and maintained continuously during project construction to avoid adverse impact to receiving waters or off site.

19. Except as authorized by this Permit, any further land development, wetlands disturbance or other construction within the total land area of this site will require additional permitting in accordance with Chapters 40D-4 and 40D-40, F.A.C.

20. All rights-of-way and easement locations necessary to construct, operate and maintain all facilities, including uplands conservation/buffer areas and wetlands, which constitute the permitted surface water management system shall be reserved for water management purposes. Prior to site occupancy the reserved areas shall be shown on any final subdivision plat and recorded in the county public records as special use areas for dedication to the responsible operation and maintenance entity.

21. Construction of the discharge control and water quality treatment facilities which are part of the permitted surface water management system shall be completed and operational prior to beneficial occupancy and use of the project development being served.

22. Establishment and survival of littoral areas provided for stormwater quality treatment in wet detention systems shall be assured by proper and continuing

maintenance procedures designed to promote viable wetlands plant growth of natural diversity and character. Certified as-built drawings depicting the established wet detention treatment areas shall be submitted to the District for inspection and approval upon completion of construction. Following as-built approval, perpetual maintenance shall be provided for the permitted system.

23. Any existing wells in the path of construction shall be properly plugged and abandoned by a licensed water well contractor in accordance with Chapter 40D-3 and Rule 17-21.10(4), F.A.C.

24. Any existing septic tanks on this site shall be abandoned at the beginning of the project construction in accordance with Rule 10D-6.53, F.A.C.

25. Any existing fuel storage tanks and fuel pumps on this site shall be removed at the beginning of project construction in accordance with Rule 17-61.05(3)(c), F.A.C.

26. All retention/detention pond side slopes, except over filter media, shall be sodded, and staked as necessary, to prevent erosion. Filter media surfaces shall also be stabilized to prevent erosion, but in a manner that does not restrict infiltration.

27. By issuance of this permit the District, its employees and representatives assume no responsibility and/or liability in regard to either the design, construction or performance of the permitted facilities.

28. Any system alteration, including for augmentation into or withdrawal of water from the permitted system, other than as specifically authorized by this permit will require additional District permitting consideration. The water level of retention and detention ponds shall not be augmented by pumping or diversion of water into the ponds to artificially control their level above the design normal or beginning storage level. Wells and diversion facilities for such augmentation may require water use permitting according to Chapter 40D-2, F.A.C.

29. Information and reports required to be submitted by this permit shall be submitted to:

Permits Data Group
Southwest Florida Water Management District
2379 Broad Street
Brooksville, Florida 34609-6899

30. Construction of all water management facilities, including wetlands compensation, grading, mulching, planting of mitigation areas, etc. must be completed prior to beneficial occupancy of the project or operation of the surface water management system.

31. The excavation of retention/detention ponds is limited to the permitted design elevation(s).

32. The permittee shall notify the District within 30 days of the sale or transfer of ownership of land on which a surface water management system will be or is located, and request transfer of the permit to the new owner. A surface water management permit to construct or alter a system can be transferred if the new permittee agrees to the transfer and the permit has not expired. The District can transfer the operation phase permit provided the project has been properly completed, the new permittee meets the rule requirements for operation and maintenance entities and the land use remains the same.

FLORIDA ENVIRONMENTAL PROTECTION

Department of Environmental Protection

Lawton Chiles
Governor

Southwest District
3804 Coconut Palm Drive
Tampa, Florida 33619

Virginia B. Wetherell
Secretary

November 3, 1997

Hardee County Landfill
c/o Mr. William H. Telford, P.E.
Post, Buckley, Schuh & Jernigan, Inc.
1560 Orange Avenue, Suite 700
Orlando, FL 32789

RE: Leachate Storage Tank Facility
FDEP Permit #: 25-0124892-001, Hardee County

Dear Mr. Telford:

Enclosed is the Environmental Resource Permit, File No. 25-0124892-3-001, issued pursuant to Chapters 373 and 403, Florida Statutes.

Appeal rights for you as the permittee and for any affected third party are described in the text of the permit along with conditions which must be met when permitted activities are undertaken. Please review this document carefully to ensure compliance with both the general and specific conditions contained herein.

Thank you for your cooperation with the permitting process and your interest in protecting the natural resources of the state of Florida. If you have any questions about this document, please contact myself or Mr. George Craciun at (813) 744-6100, ext. 329 or 332, respectively.

Sincerely,

Randall R Cooper

Randal R. Cooper, P.E.
Surface Water Engineer
Submerged Lands and Environmental Resources Program

enclosures

cc: Susan Pelz, P.E., FDEP Solid Waste Section w/o attachments
Submerged Lands and Environmental Resources Permit File
USACOE

SUBMERGED LANDS AND ENVIRONMENTAL RESOURCES
FINAL PERMIT
ENVIRONMENTAL RESOURCE PERMIT
STANDARD GENERAL PERMIT FOR MINOR SYSTEMS

PERMITTEE/AUTHORIZED ENTITY:
Hardee County BOCC
J.R. Prestridge
Assistant County Manager
412 W. Orange Street
Wauchula, FL 33873

Permit/Authorization Number:
25-0124892-001
Date of Issue: November 3, 1997
Expiration Date of Construction Phase: November 3, 2002

AGENT:
Mr. William H. Telford, P.E.
Post, Buckley, Schuh & Jernigan, Inc.
1560 Orange Avenue, Suite 700
Orlando, FL 32789

County: Hardee
Project: Surface water management system for Leachate Storage Tank Facility

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This permit is issued under the authority of Part IV of Chapter 373, F.S., Rules 62-4, 62-330, 62-343, and 40D-40, Florida Administrative Code (F.A.C.). The activity is not exempt from the requirement to obtain an environmental resource permit. Pursuant to Operating Agreements executed between the Department and the water management districts, as referenced in Chapter 62-113, F.A.C., the Department is responsible for reviewing and taking final agency action on this activity.

This permit also constitutes certification compliance with water quality standards under Section 404 of the Clean Water Act, 33 U.S.C. 1344.

A copy of this authorization also has been sent to the U.S. Army Corps of Engineers (USACOE) for review. The USACOE may require a separate permit. Failure to obtain this authorization prior to construction could subject you to enforcement action by that agency. You are hereby advised that authorizations also may be required by other federal, state, and local entities. This authorization does not relieve you from the requirements to obtain all other required permits and authorizations.

The above named permittee is hereby authorized to construct the work shown on the application and approved drawing(s), plans, and other documents attached hereto or on file with the Department and made a part hereof. **This permit is subject to the limits, conditions, and locations of work shown in the attached drawings, and is also subject to the attached General Conditions and Specific Conditions, which are a binding part of this permit.** You are advised to read and understand these drawings and conditions prior to commencing the authorized activities, and to ensure the work is conducted in conformance with all the terms, conditions, and drawings. If you are utilizing a contractor, the contractor also should read and understand these drawings and conditions prior to commencing the authorized activities. Failure to comply with all drawings and conditions shall constitute grounds for revocation of the permit and appropriate enforcement action.

Operation of the facility is not authorized except when determined to be in conformance with all applicable rules and with the general and specific conditions of this permit/certification/authorization, as specifically described below.

ACTIVITY DESCRIPTION:
The project consists of the construction of a surface water management system for a leachate storage tank and loadout facility. The system is designed to retain and percolate the first one half inch of runoff from the 1.48 acre project area (which includes proposed storage tanks and pump station, access roads, and existing buildings) in a retention area located outside of existing and proposed HDPE liner.

Attenuation for the 25 year, 24 hour storm event is also provided, but not required under the standard general for minor systems permit. No portion of the project is within the 100 year flood zone.

The original application and engineering report, received at the Department on July 23, 1997, and additional information, received on October 9, 1997, submitted by Post, Buckley, Schuh & Jernigan, Inc., and the attached general and specific conditions are made part of this permit.

ACTIVITY LOCATION:
The project is located northeast of the town of Wauchula in Section 35, Township 33 South, Range 25 East, in Hardee County.

SPECIFIC CONDITIONS:
1. If historical or archaeological artifacts, such as Indian canoes, pottery are discovered at any time within the project site the permittee shall immediately notify Wetlands Resource Management at the Southwest District Office of the Department of Environmental Protection and the Division of Historical Resources, History and Records Management, R.A. Gray Building, 500 South Bronough, Tallahassee, FL 32399-0250 or phone (904)488-1480.

2. All submittals required herein shall be directed to:
Department of Environmental Protection
Environmental Administrator
Submerged Lands & Environmental Resources
Southwest District
3804 Coconut Palm Dr.
Tampa, FL 33619

hereafter referred to as "the Department". Such submittals include, but are not limited to, record drawings, progress reports, mitigation monitoring reports and water quality monitoring reports.

All submittals shall include the permittee's name and permit number.

3. In the event that the permittee files for bankruptcy prior to completion of all work permitted and required by this permit, the permittee must notify the Department within 30 days of filing. The notification shall identify the bankruptcy court and case number and shall include a copy of the bankruptcy petition.

4. If the approved permit, drawings and the Specific Conditions contradict each other, then the Specific Conditions shall prevail.

5. The permittee shall notify the Department in writing within 14 days of any change in agents designated in the approved permit application.

6. The permittee is responsible for retaining a professional engineer registered in the State of Florida to certify that the construction of the project is in compliance with the approved permit plans.

7. All drawings, record drawings, land surveys and as-built surveys required herein shall be certified by a Professional Engineer or Registered Land Surveyor, as appropriate, registered in the State of Florida.

8. Progress reports for the project shall be submitted to the Department beginning **twelve (12) months after issuance of the permit** and shall continue to be submitted every twelve (12) months until all permitted construction of the project is completed. Progress reports must be submitted to the Department even if there is no ongoing construction. Reports shall include the current project status and the construction schedule for the following twelve (12) month period.

9. The permittee shall notify the Department in writing at least 14 days prior to commencing the work authorized in this permit utilizing the form listed in General Condition #11.

10. All exposed soils shall be stabilized using standard best management practices such as sodding or mulching within 72 hours of achieving final grade.

11. In addition to the forms specified in General Condition #13, the permittee shall submit two copies of signed, dated and sealed as-built drawings to the Department within 30 days of completion of construction. The as-built drawings shall be based on the Department permitted construction drawings which shall be revised to reflect any changes made during construction. Both the original design and constructed elevation must be clearly shown. The plans must be clearly labeled as "as-built" or "record" drawings. All surveyed dimensions and elevations required shall be verified and signed, dated and sealed by a Florida registered surveyor or engineer. Record drawings shall include the invert elevations of all culverts and controlling elevations of all permitted structures as shown in the permitted drawings.

12. The Operation and Maintenance Entity shall submit inspection form, FDEP Form # 62-343.900(6), *Inspection Certification*, in accordance with the following schedule;

> For systems utilizing retention and wet detention, the inspections shall be performed 24 months after operation is authorized and every 24 months thereafter.

13. The permittee shall be aware of and operate under #1 through #25 of the attached "General/Limiting Conditions for Environmental Standard General and Individual Permits". General/Limiting Permit Conditions are binding upon the permittee and enforceable pursuant to Chapter 403 of the Florida Statutes.

RIGHTS OF AFFECTED PARTIES

This permit is hereby granted unless a petition for an administrative proceeding (hearing) is filed pursuant to the provisions of Section 120.57, F.S., and rule 62-103, F.A.C.

A person whose substantial interests are affected by the Department's proposed decisions in this permit may petition for an administrative proceeding (hearing) in accordance with Section 120.57, F.S. Petitions filed by the permit applicant and the parties listed below must be filed within 14 days of receipt of this intent. Petitions filed by other persons must be filed within 14 days of publication of the public notice or within 14 days of their receipt of this intent, whichever first occurs. Third party petitioners shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S. The petition must be filed (received) in:

Department of Environmental Protection
Office of General Counsel, Mail Station 35
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

The petition must contain the information set forth below:

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;

(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;

(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

(d) A statement of the material facts disputed by Petitioner, if any;

(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;

(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and

(g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process will constitute a renewed determination of the Departments decision on the application. Accordingly, the Department's final action may be different from the position taken by it in this intent. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of receipt of this intent, in the Office of General Counsel at the above address. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rules 28-5.207 and 60Q-2.010, F.A.C.

Executed in Tampa, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

for Bob Stetler
Environmental Administrator
Submerged Lands and
Environmental Resources

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this permit, including all copies were mailed before the close of business on 11/3, 1997, to the above listed persons.

FILING AND ACKNOWLEDGMENT

FILED, on this date, pursuant to 120.52(9), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Clerk Robinson Date 11/3/97

Recommend by : Randal R. Cooper, P.E.
Prepared by: Ernestine Robinson

GENERAL LIMITING CONDITIONS FOR ENVIRONMENTAL STANDARD GENERAL AND INDIVIDUAL PERMITS

1. All activities shall be implemented as set forth in the plans, specifications and performance criteria as approved by this permit. Any deviation from the permitted activity and the conditions for undertaking that activity shall constitute a violation of this permit.

2. This permit or a copy thereof, complete with all conditions, attachments, exhibits, and modifications, shall be kept at the work site of the permitted activity. The complete permit shall be available for review at the work site upon request by Department staff. The permittee shall require the contractor to review the complete permit prior to commencement of the activity authorized by this permit.

3. Activities approved by this permit shall be conducted in a manner which does not cause violations of state water quality standards. The permittee shall implement best management practices for erosion and a pollution control to prevent violation of state water quality standards. Temporary erosion control shall be implemented prior to and during construction and permanent control measures shall be completed within 7 days of any construction activity. Turbidity barriers shall be installed and maintained at all locations where the possibility of transferring suspended solids into the receiving waterbody exists due to the permitted work. Turbidity barriers shall remain in place at all locations until construction is completed and soils are stabilized and vegetation has been established. Thereafter the permittee shall be responsible for the removal of the barriers. The permittee shall correct any erosion or shoaling that causes adverse impacts to the water resources.

4. Water quality data for the water discharged form the permittee's property or into the surface waters of the state shall be submitted to the Department as required by the permit. Analyses shall be performed according to procedures outlined in the current edition of Standard Methods for the Examination of Water and Wastewater by the American Public Health Association or Methods for Chemical Analyses of Water and Wastes by the U.S. Environmental Protection Agency. If water quality data are required, the permittee shall provide data as required on volumes of water discharged, including total volume discharged during the days of sampling and total monthly volume discharged from the property or into surface waters of the state.

5. Department staff must be notified in advance of any proposed construction dewatering. If the dewatering activity is likely to result in offsite discharge or sediment transport into wetlands or surface waters, a written dewatering plan must either have been submitted and approved with the permit application or submitted to the Department as a permit prior to the dewatering event as a permit modification. The permittee is advised that the rules of the Southwest Florida Water Management District state that a water use permit may be required prior to any use exceeding the thresholds in Chapter 40D-2, F.A.C.

6. Stabilization measures shall be initiated for erosion and sediment control on disturbed areas as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 7 days after the construction activity in that portion of the site has temporarily or permanently ceased.

7. Off site discharges during construction and development shall be made only through the facilities authorized by this permit. Water discharged from the project shall be through structures having a mechanism suitable for regulating upstream stages. Stages may be subject to operation schedules satisfactory to the Department.

8. The permittee shall complete construction of all aspects of the surface water management system, including wetland compensation (grading mulching,

planting), water quality treatment features, and discharge control facilities prior to beneficial occupancy or use of the development being served by this system.

9. The following shall be properly abandoned and/or removed in accordance with the applicable regulations:
   a. Any existing wells in the path of construction shall be properly plugged and abandoned by a licensed well contractor.
   b. Any existing septic tanks on site shall be abandoned at the beginning of construction.
   c. Any existing fuel storage tanks and fuel pumps shall be removed at the beginning of construction.

10. All surface water management systems shall be operated to conserve water in order to maintain environmental quality and resource protection; to increase the efficiency of transport, application and use; to decrease waste; to minimize unnatural runoff from the property and to minimize dewatering of offsite property.

11. At least 48 hours prior to commencement of activity authorized by this permit, the permittee shall submit to the Department a written notification of commencement using an "Environmental Resource Permit Construction Commencement" notice (Form No. 62-343.900(3), F.A.C.) indicating the actual start date and the expected completion date.

12. Each phase or independent portion of the permitted system must be completed in accordance with the permitted plans and permit conditions prior to the occupation of the site or operation of site infrastructure located within the area served by that portion or phase of the system. Each phase or independent portion of the system must be completed in accordance with the permitted plans and permit conditions prior to transfer of responsibility for operation and maintenance of that phase or portion of the system to a local government or other responsible entity.

13. Within 30 days after completion of construction of the permitted activity, the permittee shall submit a written statement of completion and certification by a registered professional engineer or other appropriate individual as authorized by law, utilizing the required "Environmental Resource Permit As-Built Certification by a Registered Professional" (Form No. 62-343.900(5), F.A.C.), and "Request for Transfer of Environmental Resource Permit Construction Phase to Operation Phase" (Form 62-343-900(7), F.A.C.). Additionally, if deviation from the approved drawings are discovered during the certification process the certification must be accompanied by a copy of the approved permit drawings with deviations noted.

14. This permit is valid only for the specific processes, operations and designs indicated on the approved drawings or exhibits submitted in support of the permit application. Any substantial deviation from the approved drawings, exhibits, specifications or permit conditions, including construction within the total land area but outside the approved project area(s), may constitute grounds for revocation or enforcement action by the Department, unless a modification has been applied for and approved. Examples of substantial deviations include excavation of ponds, ditches or sump areas deeper than shown on the approved plans.

15. The operation phase of this permit shall not become effective until the permittee has complied with the requirements of the conditions herein, the Department determines the system to be in compliance with the permitted plans, and the entity approved by the Department accepts responsibility for operation and maintenance of the system. The permit may not be transferred to the operation and maintenance entity approved by the Department until the operation phase of the permit becomes effective. Following inspection and approval of the

ermitted system by the Department, the permittee shall request transfer of the permit to the responsible operation and maintenance entity approved by the Department, if different from the permittee. Until a transfer is approved by the Department pursuant to Section 62-343.110(1)(d), F.A.C., the permittee shall be liable for compliance with the terms of the permit.

16. Should any other regulatory agency require changes to the permitted system, the Department shall be notified of the changes prior to implementation so that a determination can be made whether a permit modification is required.

17. This permit does not eliminate the necessity to obtain any required federal, state, local and special district authorizations including a determination of the proposed activities' compliance with the applicable comprehensive plan prior to the start of any activity approved by this permit.

18. This permit does not convey to the permittee or create in the permittee any property right, or any interest in real property, nor does it authorize any entrance upon or activities on property which is not owned or controlled by the permittee, or convey any rights or privileges other than those specified in the permit and Chapter 40D-4 or Chapter 40D-40, F.A.C.

19. The permittee is hereby advised that Section 253.77, F.S., states that a person may not commence any excavation, construction, other activity involving the use of sovereign or other lands of the state, the title to which is vested in the Board of Trustees of the Internal Improvement Trust Fund without obtaining the required lease, license, easement, or other form of consent authorizing the proposed use. Therefore, the permittee is responsible for obtaining any necessary authorizations from the Board of Trustees prior to commencing activity on sovereignty lands or other state-owned lands.

20. The permittee shall hold and save the Department harmless from any and all damages, claims, or liabilities which may arise by reason of the activities authorized by the permit or any use of the permitted system.

21. Any delineation of the extent of a wetland or other surface water submitted as part of the permit application, including plans or other supporting documentation , shall not be considered binding unless a specific condition of this permit or a formal determination under section 373.421(2), F.S., provides otherwise.

22. The permittee shall notify the Department in writing within 30 days of any sale, conveyance, or other transfer of ownership or control of the permitted system or the real property at which the permitted system is located. All transfers of ownership or transfers of a permit are subject to the requirements of section 62-343.130, F.A.C. The permittee transferring the permit shall remain liable for any corrective actions that may be required as a result of any permit violations prior to such sale, conveyance or other transfer.

23. Upon reasonable notice to the permittee, Department authorized staff with proper identification shall have permission to enter, inspect, sample and test the system to insure conformity with Department rules, regulations and conditions of the permits.

24. If historical or archaeological artifacts are discovered at any time on the project site, the permittee shall immediately notify the Department and the Florida Department of State, Division of Historical Resources.

25. The permittee shall immediately notify the Department in writing of any previously submitted information that is later discovered to be inaccurate.

To: Ken Huntington KH

From: Randy Cooper RC

Date: October 29, 1997

File No. 25-124892-001

Name: Hardee County Landfill Leachate Storage Tank Facility, Standard General for Minor Surface Water Systems Permit

This project is for the construction of a surface water management system for leachate storage tanks and pump station, access road, and existing maintenance building, parking lot, and shed. Total project area is about 1.48 acres of which 0.82 acres will be impervious surfaces. Water quality treatment for the first 1/2 inch of runoff from the project area will be provided by a retention pond which is located outside of the existing HDPE liner which underlies most of the landfill. Attenuation is not required and no portion of the project is within the 100 year flood plain.

Maintenance of the system will be performed by landfill personnel.

copy for
reading file

ATTACHMENT H-13

LEACHATE SUMP CALCULATIONS

SCS ENGINEERS

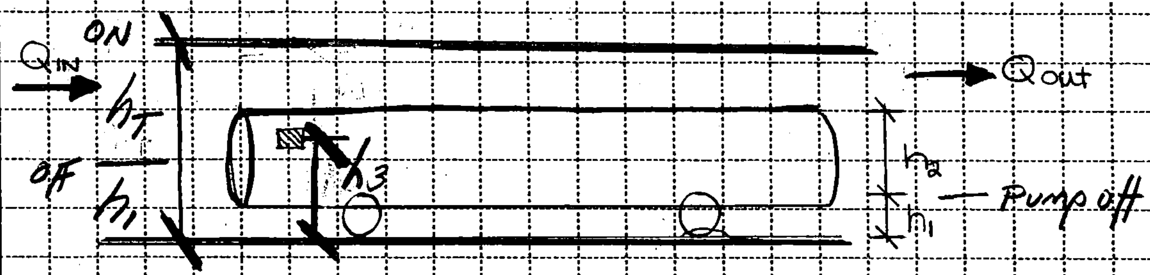
SHEET 1 OF 5

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Leachate Sump Sizing	LEK	2/20/04
	CHECKED HD	DATE

OBJECTIVE

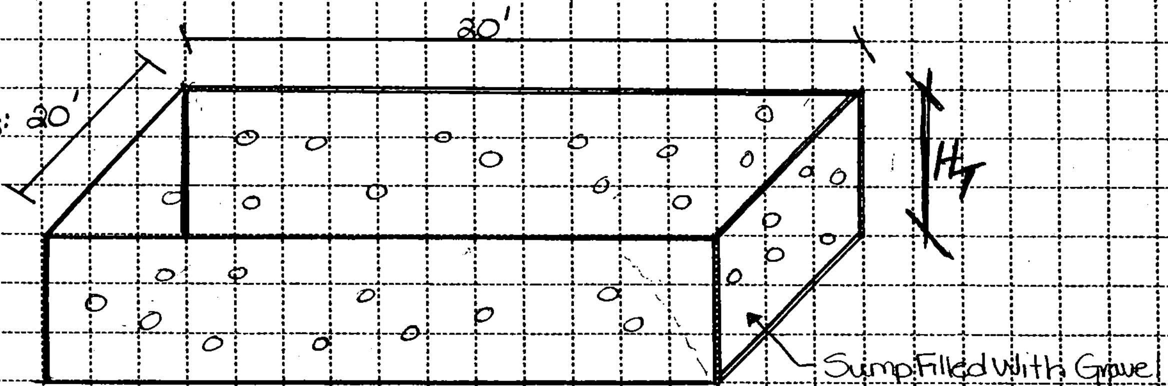
Size the leachate sump to ensure the Leachator pump cycles less than 15 starts per hour (i.e. every 4 minutes)



h_1 = 4" (Pump off) Q_{IN} = 153 gpm (HELP Model)
h_2 = 7" (SUCTION INTAKE) Q_{out} = 200 gpm (Leachator Pump)
h_3 = 6" (TRANSDUCER height)
h_T = THICKNESS (required) for cycle times of pumps

FIND H REQUIRED TO KEEP PUMP CYCLES LESS THAN 15 CYCLES PER HOUR

SUMP DIMENSIONS: 20'



$Q_{NET} = Q_{OUT} - Q_{IN} = 200 \text{ gpm} - 153 \text{ gpm} = 47 \frac{\text{gal}}{\text{min}} \times \frac{\text{cf}}{7.48 \text{ gal}} = 6.3 \text{ cfm}$

GROSS SUMP VOLUME $= 20' \times 20' \times H' = 400(H_T) \text{ ft}^3$

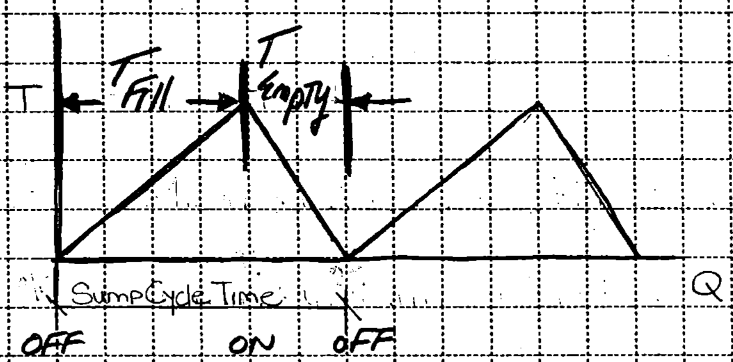
SCS ENGINEERS

SHEET 2 OF 5

CLIENT	PROJECT		JOB NO.
Hardee County	Landfill Expansion		09199033.09
SUBJECT: Leachate Sump Sizing		BY: LEK	DATE: 2/20/04
		CHECKED: [illegible]	DATE

$$\text{POROSITY} = \frac{\text{VOLUME OF VOIDS}}{\text{SUMP VOLUME}} = 46\%$$ (Attachment 3)

AVAILABLE VOLUME OF VOIDS = $0.46 \times 400H = 184(H_T)\ ft^3$



Minimum Sump Cycle Time = 4 min (15 cycles/hr)

$$T_{FILL} = \frac{184(H)\,cf}{153\frac{gal}{min} \times \frac{cf}{7.48\,gal}} = 9.0\,(H)\,min/ft \quad \text{THICKNESS OF SUMP}$$

$$T_{EMPTY} = \frac{184(H)\,cf}{6.3\,cfm} = 29.2(H)\,min/ft \quad \text{THICKNESS OF SUMP}$$

Find H: Sump Cycle Time = $T_{FILL} + T_{EMPTY}$ = $9.0(H) + 29.2(H)$

4 min (15 cycle/hr.)
$4\,min = 9(H)\frac{min}{ft} + 29.2(H)\frac{min}{ft}$
$4\,min = 38.2(H)\frac{min}{ft}$
$0.1\,ft = H$
$1.26\,in = H$

6 min (10 cycle/hr.)
$6\,min = 38.2(H)\frac{min}{ft}$
$1.9\,in = H$

10 min (6 cycle/hr.)
$10\,min = 38.2(H)\frac{min}{ft}$
$3.1\,inch = H$

LESS THE HALF THE MAX. STARTS RECOMMENDED

OK F.S > 2.0

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Leachate Sump Sizing	LEK	2/20/04
	CHECKED	DATE

CONCLUSION

Set the sump height 3.1 inches above transducer height. The total sump depth is 4" + 3.1" = 7.1" This depth corresponds w/ the pump cycling every 10 minutes (6 cycles/hr)

Sump dimensions = 20' x 20' x 7.1" (only for pump cycles More for cover)

Note: The pump is located in a 24" riser pipe. For structural purposes, 12 inches of stone will be atop the riser pipe.

$h_T = 3.1"$ (CYCLE TIME IS LESS THAN HALF THE ~~REQUIRED~~ RECOMMENDED CYCLE TIMES OK)

TOTAL THICKNESS OF SUMP IS 12 INCHES OF COVER OVER THE 24 INCH PIPE

TOTAL THICKNESS IS $h_{sump} = 12" + 24"$

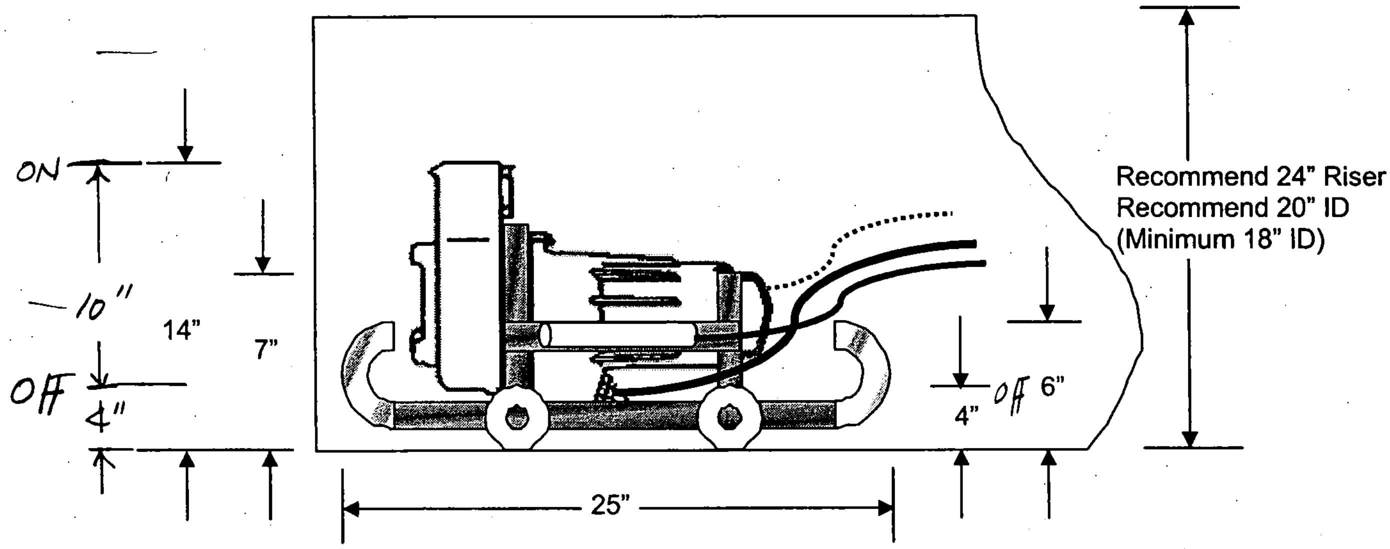
$= 36$ INCHES

Volume (For pump cycling) is

$$V_{pump} = 20ft \times 20ft \times \left(\frac{7.1 in}{12 in}\right) ft \times \underset{\text{Porosity}}{0.46} = 108.9 ft^3 \ (814 gal)$$

SERIES 30XP68

SUMP LAYOUT DIMENSIONS



NOTES:
Height of Transducer from the bottom of the riser is approx. 6". This is where the level display would show 0", however there will be 6" of liquid still in the sump.

The approx. height from the bottom of the riser to the pump suction is 7". Level display would show 2 to 4".

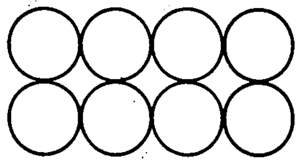
Off level would need to be set no lower than 4", to prevent the pump from running dry.

On level can be set from 10" or greater, keeping in mind that the pump is rated for a maximum of 15 starts per hour.

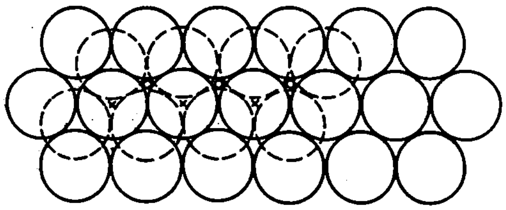
The pump does not have a strainer. The original info you provided mentioned sand and small rocks would/could be present, so we have provided a pump that can pass solids up to 1¼" in size and handle sand real well.

Soil Mechanics
T. William Lambe & Robert V. Whitman
1969

SHEET 5 of 5



(a)



(b)

Fig. 3.2 Arrangements of uniform spheres. (a) Plan and elevation view: simple cubic packing. (b) Plan view: dense packing. Solid circles, first layer; dashed circles, second layer; ∘, location of sphere centers in third layer: face-centered cubic array; ×, location of sphere centers in third layer: close-packed hexagonal array. (From Deresiewicz, 1958.)

these simple packings can be computed from the geometry of the packings, and the results are given in Table 3.2.

This table also gives densities for some typical granular soils in both the "dense" and "loose" states. A variety of tests have been proposed to measure the maximum and minimum void ratios (Kolbuszewski, 1948). The test to determine the maximum density usually involves some form of vibration. The test to determine minimum density usually involves pouring oven-dried soil into a container. Unfortunately, the details of these tests have not been entirely standardized, and values of the maximum density and minimum density for a given granular soil depend on the procedure used to determine them. By using special measures, one can obtain densities greater than the so-called maximum density. Densities considerably less than the so-called minimum density can be obtained, especially with very fine sands and silts, by slowly sedimenting the soil into water or by fluffing the soil with just a little moisture present.

Table 3.2 Maximum and Minimum Densities for Granular Soils

	Void Ratio		Porosity (%)		Dry Unit Weight (pcf)	
Description	e_{max}	e_{min}	n_{max}	n_{min}	$\gamma_{d\,min}$	$\gamma_{d\,max}$
Uniform spheres	0.92	0.35	47.6	26.0	—	—
Standard Ottawa sand	0.80	0.50	44	33	92	110
Clean uniform sand	1.0	0.40	50	29	83	118
Uniform inorganic silt	1.1	0.40	52	29	80	118
Silty sand	0.90	0.30	47	23	87	127
Fine to coarse sand	0.95	0.20	49	17	85	138
Micaceous sand	1.2	0.40	55	29	76	120
Silty sand and gravel	0.85	0.14	46	12	89	146

B. K. Hough, *Basic Soils Engineering*. Copyright © 1957, The Ronald Press Company, New York.

The smaller the range of particle sizes present (i.e., the more nearly uniform the soil), the smaller the particles, and the more angular the particles, the smaller the minimum density (i.e., the greater the opportunity for building a loose arrangement of particles). The greater the range of particle sizes present, the greater the maximum density (i.e., the voids among the larger particles can be filled with smaller particles).

A useful way to characterize the density of a natural granular soil is with relative density D_r defined as

$$D_r = \frac{e_{max} - e}{e_{max} - e_{min}} \times 100\%$$

$$= \frac{\gamma_{d\,max}}{\gamma_d} \times \frac{\gamma_d - \gamma_{d\,min}}{\gamma_{d\,max} - \gamma_{d\,min}} \times 100\% \qquad (3.1)$$

where

e_{min} = void ratio of soil in densest condition
e_{max} = void ratio of soil in loosest condition
e = in-place void ratio
$\gamma_{d\,max}$ = dry unit weight of soil in densest condition
$\gamma_{d\,min}$ = dry unit weight of soil in loosest condition
γ_d = in-place dry unit weight

Table 3.3 characterizes the density of granular soils on the basis of relative density.

Table 3.3 Density Description

Relative Density (%)	Descriptive Term
0–15	Very loose
15–35	Loose
35–65	Medium
65–85	Dense
85–100	Very dense

MOISTURE TE

$\omega = \frac{M_s}{M_w}$

Values of water content for natural granular soils vary from less than 0.1% for air-dry sands to more than 40% for saturated, loose sand.

Typical Values of Phase Relationships for Cohesive Soils

The range of values of phase relationships for cohesive soils is much larger than for granular soils. Saturated sodium montmorillonite at low confining pressure can exist at a void ratio of more than 25; saturated clays

SECTION I

HYDROGEOLOGICAL INVESTIGATION REQUIREMENTS

I.1 HYDROLOGICAL INVESTIGATION AND SITE REPORT

See Hydrogeological Investigation contained in Attachment I-1.

I.1.a Site Specific Geology and Hydrogeology

See Hydrogeological Investigation contained in Attachment I-1.

I.1.b Direction and Rate of Groundwater Flow

See Hydrogeological Investigation contained in Attachment I-1.

I.1.c Background Water Quality

See Hydrogeological Investigation contained in Attachment I-1.

I.1.d On-site Aquifer Hydraulic Connections

See Hydrogeological Investigation contained in Attachment I-1.

I.1.e Site Stratigraphy

See Hydrogeological Investigation contained in Attachment I-1.

I.1.f Topography and Soil Types

See Hydrogeological Investigation contained in Attachment I-1.

I.1.g Well Inventory

See Hydrogeological Investigation contained in Attachment I-1.

I.1.h Existing Contaminated Areas

See Hydrogeological Investigation contained in Attachment I-1.

I.1.i Well Map

See Hydrogeological Investigation contained in Attachment I-1.

ATTACHMENT I-1

HYDROGEOLOGICAL INVESTIGATION

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

REVISED HYDROGEOLOGICAL INVESTIGATION

ATTACHMENT I-1
TO THE

CONSTRUCTION PERMIT APPLICATION
FOR
HARDEE COUNTY LANDFILL EXPANSION

Prepared for:

Hardee County
Board of County Commissioners
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Wauchula, Florida
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SCS Engineers
Florida Certificate of Authorization No. 00004892

File No. 09199033.11
November 15, 2004

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SECTION I

INTRODUCTION

This hydrogeological investigation is being submitted concurrently with the Hardee County Construction Application for Expansion Plan to fulfill the requirement of Chapter 62-701.410(1) of the Florida Administrative Code.

BACKGROUND

Hardee County owns and operates a 12.5-acre landfill under Department of Environmental Protection (FDEP) Permit Number 38414-002-SO, Modification 38414-006. The landfill is located on a 115 acres parcel (the site). The expansion area will include an additional 10 acres to the west and south of the current permitted landfill. The site is located on Airport Road, approximately one mile north of State Road 636 in Wauchula, Florida, as shown on Figure I-1.

SITE SPECIFIC GEOLOGY

The hydrogeologic system underlying the Hardee County Landfill consists of a thick sequence of carbonate rocks overlain by clastic deposits ranging in age from Holocene to Paleocene. These units are shown in Table I-1 and are described below.

The youngest deposits are surficial sands, terrace sands, and phosphorites of Holocene and Pleistocene age, with an average depth of 25 feet. Clayey and pebbly sand, clay marl and shell underlie the surficial sands.

The carbonates and clastics of the Miocene age consist of the Hawthorn Formation and the underlying Tampa Limestone. The top of the Hawthorn Formation occurs at depths of approximately 160-370 feet below land surface (bls). The Hawthorn Formation consists of dolomite and limestone that is soft, chalky, fine grained to sandy or pebbly and includes phosphorite grains. The Tampa Limestone consists of sandy and phosphatic fossiliferous limestone that can have sand and clay units. The Tampa Limestone represents the top of the Floridan Aquifer.

The materials that underlie the Tampa Limestone are primarily limestone units and dolomitic limestone units that range in age from Oligocene to Eocene and are designated, in downward order as, the Suwannee Limestone, the Ocala Group, and the Avon Park Limestone.

The Suwannee Limestone is primarily composed of sandy fossiliferious carbonate sediments. The Ocala Group underlies the Suwannee, which is a fossiliferous cream white limestone some with foraminifers and dolomite near the bottom. The Avon Park underlies the Ocala Group and consists of limestone and hard brown dolomite with intergranular evaporites in lower parts of the formation.

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System	Series	Stratigraphic unit	General lithology	Major lithologic unit	Hydrogeologic unit
Quaternary	Holocene and Pleistocene	Surficial sand, terrace sand, phosphorite	Predominantly fine sand; interbedded clay, marl, shell, and phosphorite.	Sand	SURFICIAL AQUIFER
Quaternary / Tertiary	Pleistocene / Pliocene	Undifferentiated deposits[1] Tamiami Formation	Clayey and pebbly sand; clay, marl, shell, phosphatic.	Clastic	Confining unit
Tertiary	Miocene	Hawthorn Formation	Dolomite, sand, clay, and limestone; silty, phosphatic.	Carbonate and clastic	Aquifer
Tertiary	Miocene	Tampa Limestone	Limestone, sandy, phosphatic, fossiliferous; sand and clay in lower part in some areas.	Carbonate and clastic / Carbonate	Aquifer / Confining unit
Tertiary	Oligocene	Suwannee Limestone	Limestone, sandy limestone, fossiliferous.	Carbonate	Upper Floridan aquifer
Tertiary	Eocene	Ocala Limestone	Limestone, chalky, foraminiferal, dolomitic near bottom.	Carbonate	Upper Floridan aquifer
Tertiary	Eocene	Avon Park Formation	Limestone and hard brown dolomite; intergranular evaporite in lower part in some areas.	Carbonate / Carbonate with evaporites	Upper Floridan aquifer / Middle confining unit
Tertiary	Eocene and Paleocene	Oldsmar and Cedar Keys Formation	Dolomite and limestone, with intergranular gypsum and anhydrite.	Carbonate with evaporites / Evaporites	Middle confining unit / Lower Floridan aquifer / Sub-Floridan confining unit

SOURCE: DUERR and ENOS, 1991.

SCS ENGINEERS

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Table I–1. Hydrological Framework of the Hardee County Region.

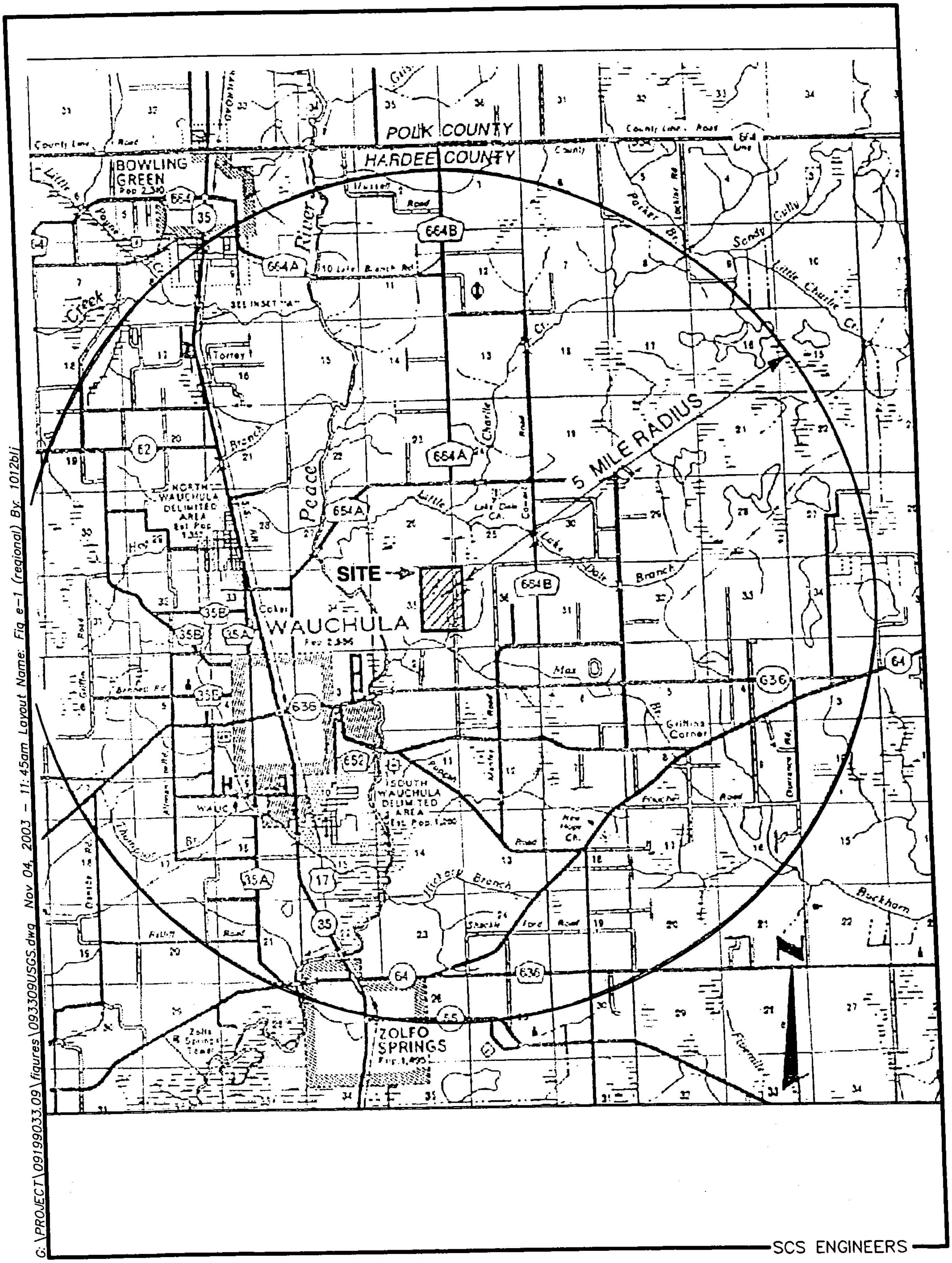

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Figure I–1. Regional Map Hardee County Landfill, Hardee County, Florida.

TOPOGRAPHY

The portion of the 1955 United States Geological Survey (USGS) Quadrangle map of Wachula, Hardee County showing the site is provided on Figure I-2. The figure shows the unaltered topographic varies from a high of 85 feet NGVD at the north end of the property to a low of 75 feet NGVD at the south end.

The topography of the site has subsequently been altered by land filling operations. Currently the topographic high is 145 feet NGVD at the top of the fill area. The topographic low is 70 feet above NGVD located in the southern borrow pit. Figure I-3 shows the current topography of the site.

SOIL TYPES

According to the United States Department of Agriculture (USDA) *Soil Survey of Hardee County* the site is composed of five soil classifications. The dominant soil types are the Pomona fine sand, Farmton fine sand, followed by the Floridana mucky fine sand, the Kaliga muck, and finally the Immokalee fine sand. A map showing the soil classifications is shown on Figure I-4.

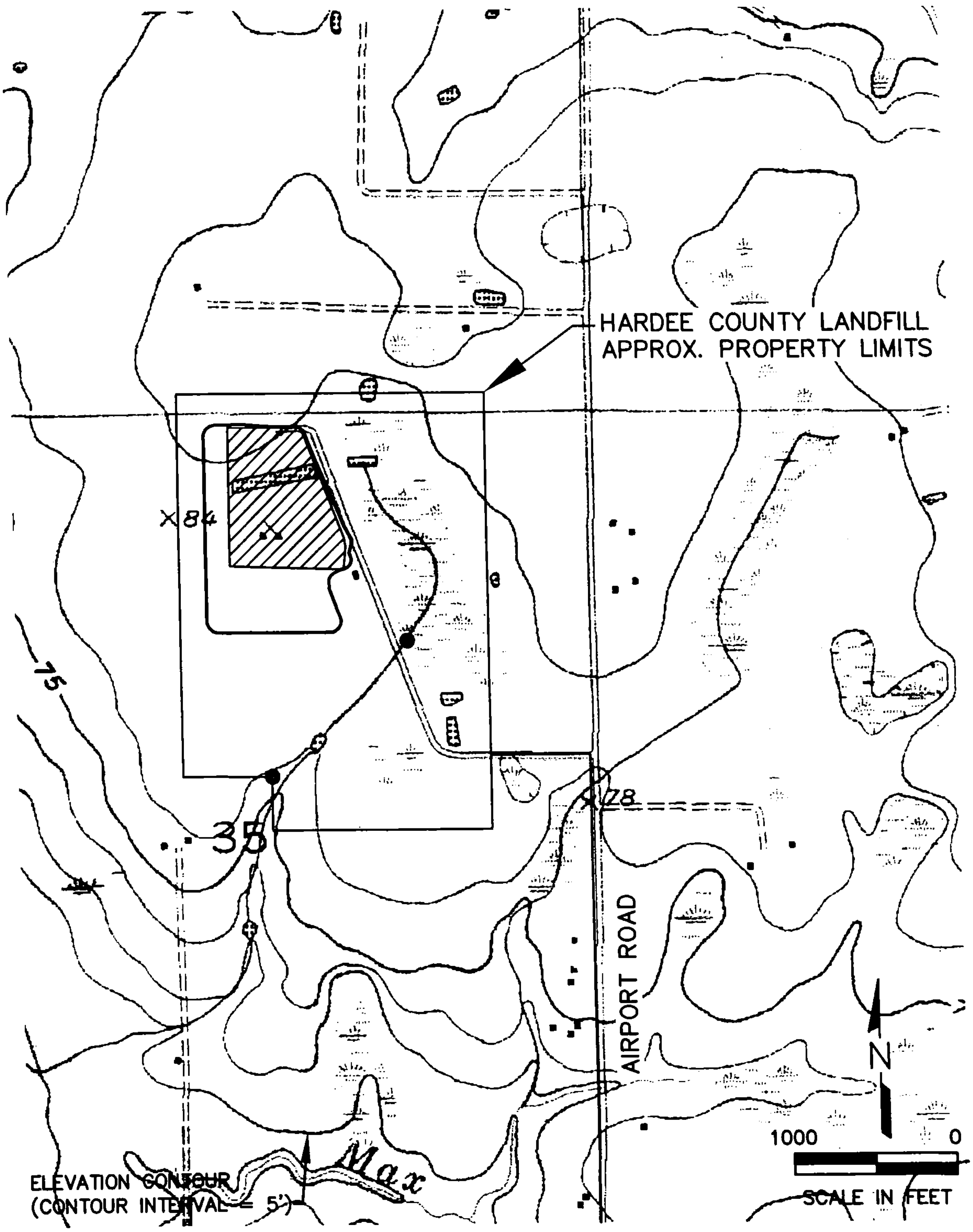
The Pomona fine sand is a nearly level and poorly drained. Approximately 60 percent of the site is composed of the Pomona fine sand. The surface layer is black fine sand about 3 inches thick. The subsurface is fine sand about 24 inches thick. Permeability is moderately slow in the lower part of the subsoil and rapid in the other layers.

The Farmton fine sand is poorly drained in nearly level flatwoods. Nearly 15 percent of the site is composed of this material. The surface layer is black fine sand about 6 inches thick. The subsurface layer is fine sand to a depth of about 34 inches.

The Floridana mucky fine sand is very poorly drained in wet depressions. The Floridana muck fine sand makes up approximately 10 percent the site. The surface layer is about 15 inches thick and the subsurface layer extends to a depth of 32 feet. Permeability is rapid in the surface layer and slow or very slow in the subsoil.

The Kaliga muck is a very poorly drained nearly level organic soil in low depressions. Approximately 10 percent of the site is composed of the Kaliga muck. The surface layer is black muck about 25 inches thick. Below the muck there is very dark gray fine sandy loam to a depth of 35 inches, dark gray sandy clay loam to a depth of 80 inches. Permeability is rapid in the surface layer and slow or very slow between depths of 35 and 60 inches.

Immokalee fine sand is poorly drained; the surface is typically very dark gray fine sand about 5 inches thick. The subsurface layer is gray fine sand to a depth of about 44 inches. The subsoil is fine sand to a depth of 80 inches. The upper 4 inches is black, and the lower 32 inches is dark reddish brown. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil.



SOURCE: WAUCHULA USGS QUADRANGLE MAP, 1955, Photo Revised 1987

SECTION: 35 TOWNSHIP: 33S RANGE: 25E

SECTION: 26 TOWNSHIP: 33S RANGE: 25E

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Figure I–2. 1955 USGS Quadrangle Map, Hardee County Landfill, Hardee County, Florida.

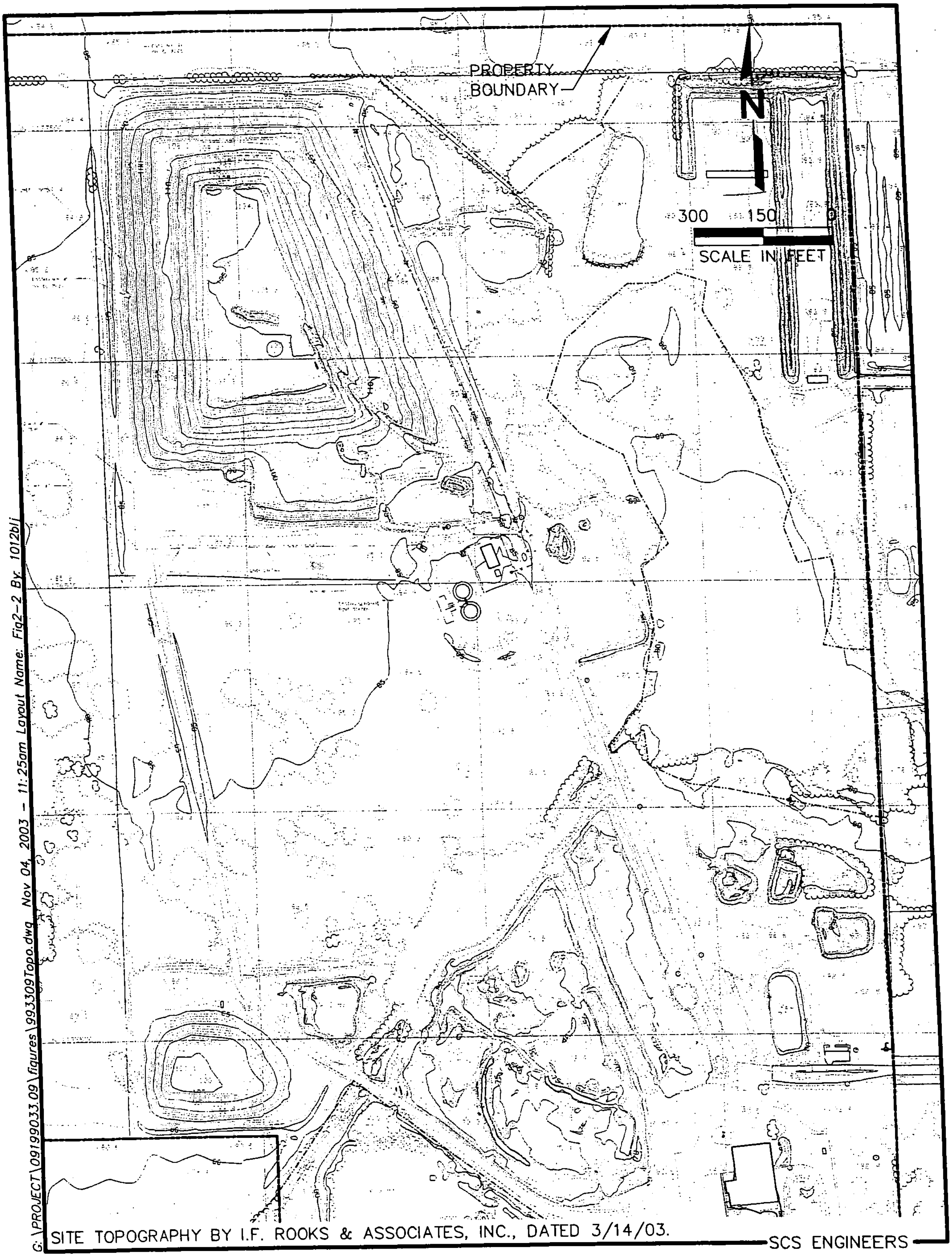

Figure I–3. Hardee County Landfill Site Topography.

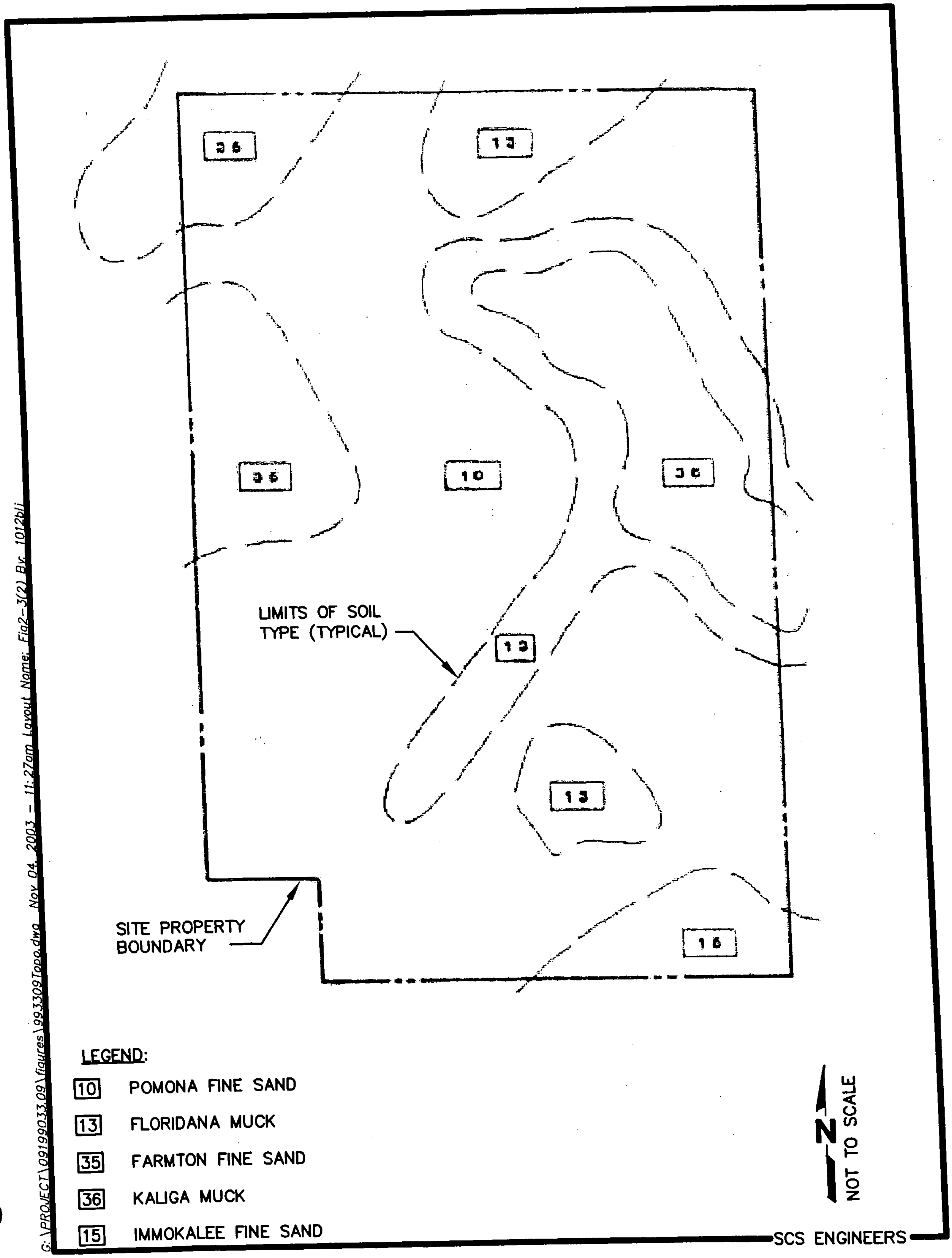

Figure I–4. USDA Soil Classifications for the Hardee County Landfill Site.

SITE STRATIGRAPHY

Several test borings were completed on the site in order to assess site stratigraphy. ENVISORS, Inc., conducted the initial borings in 1983 prior to construction of the landfill. PSI conducted borings in 1997 in connection with the former sprayfield and additional borings were conducted in July 2003 by SCS Engineers for the expansion of the landfill. The locations of all borings are shown in Figure I-5.

The stratigraphy of the site is shown on drawings in Attachment I-1. The majority of the borings were conducted to verify the presence and extent of the clay confining unit. The top of the borings include gray to brown sand overlying the clay units. The borings show the top of the clay layer ranges from 7 feet below land surface in the south west corner of the site to 15 feet below land surface in the north east corner of the site. The clay ranges in thickness from 12 to 60 feet thick. The west central boring show the clay layer to be 30 feet thick and underlain by limestone at 40 feet below land surface where the boring was terminated. The southwest boring showed clay approximately 7 feet bls and extending to 50 feet below land surface where lime rock was encountered.

In addition to the borings, the lateral extent and depth of clay was mapped using a refraction seismic survey. The survey was limited to the Phase I footprint. The results of the survey are shown in Attachment I-1. The results show that the top of the underlying clay in the fill area ranges from about 8.2 to 18.0 feet below ground surface. The clay layer appeared to be continuous across the site.

Additional borings conducted by PSI in 1997 and SCS in 2003 confirm the findings of the 1983 ENVISORS borings.

SITE SPECIFIC HYDROGEOLOGY

Three aquifer systems are present in the geologic sections described above. These are in downward order, the surficial aquifer, the intermediate aquifer, and the Floridan aquifer system. General characteristics for each aquifer are discussed below.

SURFICIAL AQUIFER

The surficial aquifer occurs in deposits that contain clayey sand, shell, shelly marl and some phosphoritic sediments and is unconfined (i.e. contains groundwater under atmospheric pressure). The thickness ranges from 25 to 100 feet in the Hardee County Region and yields from the aquifer is not a major source of water in the region, although some small diameter wells are used for lawn irrigation and stock watering.

The top of the surficial aquifer at the Hardee County Landfill site generally occurs at land surface to nine feet below land surface. Thickness of the unit averages 15 feet in the project area. The hydraulic conductivity of the aquifer at the Hardee County Landfill is approximately seven feet per day based on a SCS Engineers aquifer performance test performed in June 2003.

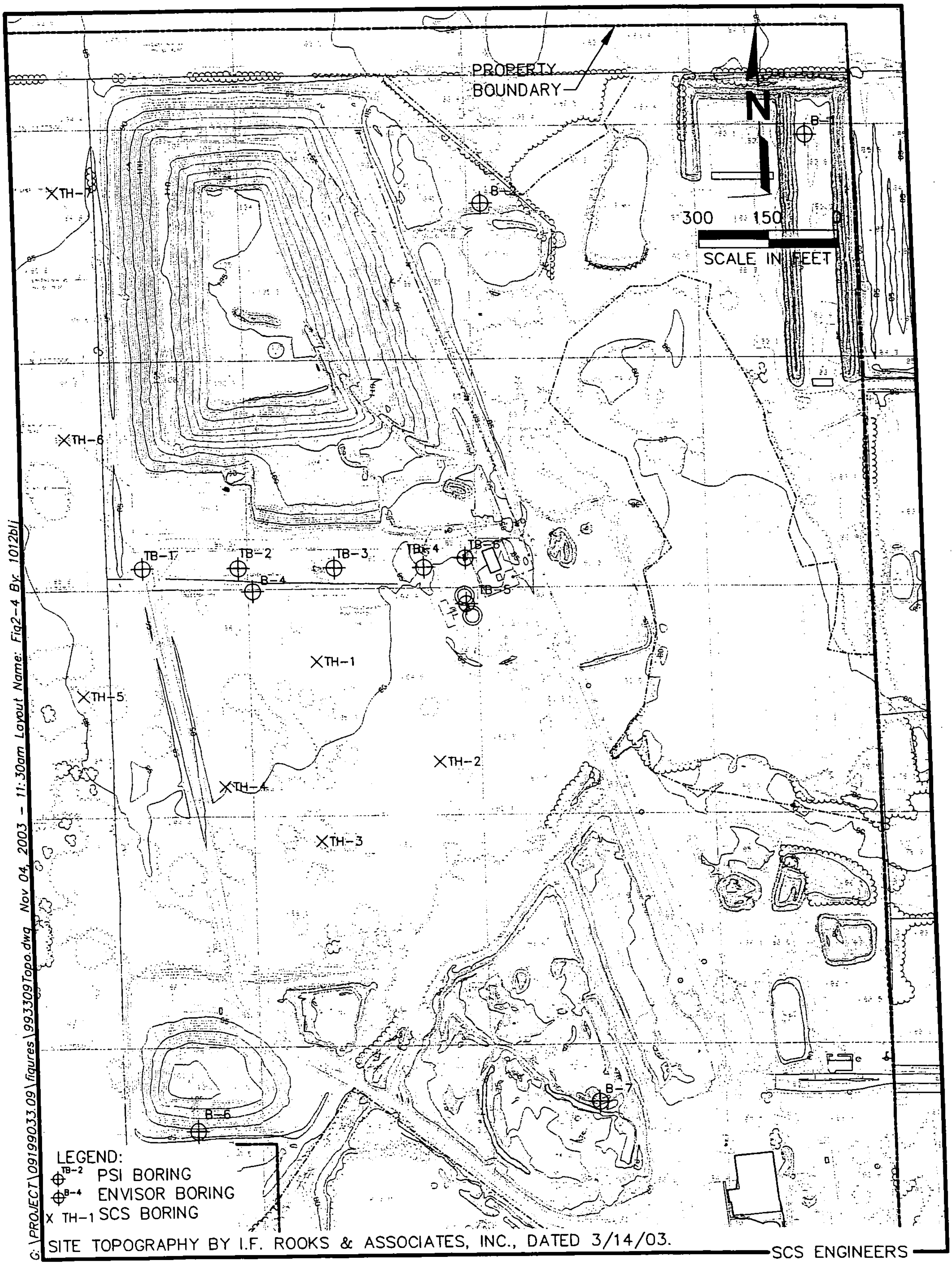

Figure I-5. Hardee County Landfill Soil Boring Locations.

Surficial Aquifer Groundwater Flow Direction

Groundwater flow assessment measurements were conducted for the surficial aquifer for each of the semi-annual monitoring periods from June 1999 through December 2002. The assessment activities included the collection of groundwater depth measurements and the calculation of groundwater elevations in the site wells and piezometers. These data have been plotted and contoured on site figures to assess groundwater flow direction. These figures are presented in the most recent biennial report and show the potentiometric surface of the surficial aquifer (Attachment I-2, Figure E1-E8).

The approximate groundwater flow direction during the period June 1999 to July 2004~~December 2002~~ in the surficial aquifer was south to southeast with exception to December 2002 and July 2004. The December 2002 groundwater flow direction indicated an area of converging groundwater flow in the southwest section of the landfill and in July 2004 the flow was convergent toward the south central area of the landfill ~~,~~ the cause of these~~is~~ apparent flow directions are~~is~~ undetermined.

Chastain and Skillman resurveyed all groundwater wells and piezometers in July 2 2003. The June 2003, December 2003 and the July 2004 flow maps were generated using the new survey data. Table I-2 shows the new and old top of casing elevations for piezometers and groundwater monitoring wells on the site. Due to the deficiency of groundwater measurements in the southern portion of the landfill it is difficult to thoroughly ascertain the flow direction in the southern portion of the landfill. Water levels will be collected in the wells and piezometers listed in Table I-2 monthly to further to assess the flow in this area. Following six months of water level measurements the groundwater flow in the southern portion of the landfill will be reevaluated.~~Additional assessment is planned in this area to including resurveying the piezometers.~~

The HDPE sidewall liner located along the perimeter of the landfill influences surficial groundwater flow direction. Groundwater flow along the landfill appears to be south, flowing along the side wall liner with exception of the southeast area of the site. Piezometer P-11 flow appears to converge from both the north and the south. The cause of this flow direction is undetermined at this time. Additional water level measurement points will be installed to further define the flow in this area.

Hydrographs depicting the groundwater elevations within each well for each sampling event from June 1999 through December 2002 were generated and presented in Attachment I-2, Figure E-9. The groundwater level calculations indicated higher groundwater table elevations in the December monitoring events and lower groundwater table elevations in the June monitoring events.

Surficial Aquifer Characteristics

Based on the potentiometric surface figures in Attachment I-2 and the groundwater elevation from June 1999 through December 2002, the maximum hydraulic gradient of the surficial

TABLE I-2 SURVEY DATA 2004

Well ID	TOC Elevation 2003*	TOC OLD	Difference
MW-1	87.92	87.97	-0.05
MW-2	85.75	85.86	-0.11
MW-3	87.74	87.75	-0.01
MW-4	87.17	87.16	0.01
MW-5	88.67	88.76	-0.09
MW-6	88.00	87.94	0.06
MW-7	87.56	87.51	0.05
MW-8	89.07	88.98	0.09
MW-9	88.71	88.71	0.00
P-3	89.40	89.23	0.17
P-4	88.36	88.34	0.02
P-5	89.30	89.25	0.05
P-11	88.25	87.16	1.09
P-12	88.75	NA	NA
P-13	87.65	NA	NA
P-14	86.99	NA	NA
NOTES:			
NA=	Not Available		
P=	Piezometer		
MW=	Monitoring Well		
TOC	Top of Casing		
*=	Survey conducted on 7/2/2003 by Chastain and Skillman		

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aquifer at the landfill was calculated to be 0.01 feet/foot at the southeastern section of the landfill. The average hydraulic gradient of the aquifer is somewhat lower.

On June 6, 2003 SCS Engineers performed a slug test on monitoring wells MW-8 and MW-4. The results of the test are provided in Attachment I-3. Slug test data for the two onsite wells indicate a hydraulic conductivity of 4.9 ft/day at MW-4, located in the northern portion of the site and 9.0 ft/day at MW-8, south of the landfill, in the proposed expansion area.

The effective porosity of the surficial aquifer sands was estimated to be 20 percent using porosity and specific retention values listed in *Groundwater Hydrology*, Todd, 1980. The porosity value was obtained by taking the difference between the porosity and specific retention for fine sand.

Surficial Aquifer Groundwater Flow Rate

The above aquifer characteristics were utilized to obtain the onsite groundwater flow velocity. The approximate maximum horizontal groundwater flow velocity (v) in the surficial aquifer at the landfill was calculated using the following equation.

$$v = \frac{K(dh/dl)}{n}$$

where v = groundwater flow velocity
K = hydraulic conductivity
dh/dl = hydraulic gradient
n = effective porosity

For the purposes of this evaluation the most conservative hydraulic conductivity of 9.0 ft/day was utilized to calculate surficial groundwater flow velocity. The effective porosity of the sands of the surficial aquifer was estimated at 0.20. Based on the above information the calculated groundwater flow velocity within the surficial was calculated to be 0.45 ft/day. However, it should be noted that 0.45 feet/day is a liberal estimate of the groundwater flow velocity onsite and is not representative of groundwater velocity at all locations.

Surficial Aquifer Background Water Quality

High iron and color characterize background surficial aquifer quality in the Hardee County area. Concentrations of the major-ions (TDS, hardness, chloride, and sulfate) are generally within potable use limits.

All monitoring wells located at the Hardee County Landfill are completed in the surficial aquifer. The water quality observed at these wells is discussed in detail in the May 2003 Hardee Biennial Groundwater Monitoring Plan Evaluation, provided in Attachment I-2. The findings are summarized below.

Constituents detected in groundwater samples at concentrations above the FDEP secondary drinking water standards and FDEP groundwater cleanup target levels include

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iron, vanadium, and pH. Exceedances for iron and pH were detected in both background and detection monitoring wells. No exceedances of primary drinking water standards have been observed.

Iron – Iron has consistently been detected above the Secondary Drinking Water Standard (SDWS) of 300 ug/L in surficial monitoring wells MW-1, MW-2, MW-4, MW-5, MW-8 and MW-9. These wells are in upgradient, cross gradient, and downgradient locations at the site. There has been no definitive trend in iron concentrations. Iron is a naturally occurring element and has been detected in the surficial aquifer in this region at concentrations of 43,900 µg/L, according to the Florida Geological Survey (FGS) Special Publication No. 34.

pH – pH measurements consistently have been outside (below) the SDWS range of 6.5-8.5 in all on site surficial monitoring wells, including the surficial aquifer background monitoring well, MW-4. There have been no definitive trends in pH concentrations. The surficial aquifer in Florida is characterized by a low pH.

Vanadium – Vanadium was detected above the Groundwater Cleanup Target Level (GCTL) of 49 ug/L in surficial monitoring well MW-9 during the June 2001 monitoring event. Vanadium is a naturally occurring metal in the Florida associated with phosphate sediments.

INTERMEDIATE AQUIFER

The intermediate aquifer system consists of three hydrogeologic units (1) a sandy clay and clayey sand confining unit in the lower part that lies directly above the upper Floridan aquifer, (2) one or more water bearing units composed primarily of sand and carbonate rocks (3) a sandy clay, clay and marl confining unit in the upper part that separates the intermediate aquifer from the lower surficial aquifer.

The confining units of the intermediate aquifer retards vertical movement of groundwater between its water-bearing units and the overlying surficial aquifer and the underlying Floridan aquifer. To further characterize the confining unit underlying the expansion area soil borings were collected on May 23, 2003 from the northwest section of the site by SCS Engineers and were field described and lab analyzed. The results indicate the confining unit underlying the expansion area is approximately 10 feet thick, consisting of gray brown yellow silty clay with a permeability of 1.1×10^{-7} cm/sec.

The boring logs are further discussed in the geotechnical section of Hardee County Construction Application for Expansion Plan. The borings were terminated in the intermediate aquifer to a maximum depth of 80 feet bls. Regional hydrogeologic data indicate the intermediate aquifer can extend to greater than 200 feet NGVD.

Ryder (1982) reported transmissivities of the water bearing unit of the intermediate aquifer system, as determined by field tests ranging from 400 to 7,000 ft^2/d in Hardee County. Near the Peace River transmissivities were generally higher than 4,000 ft^2/d.

According to Wilson, 1977 and potentiometric flow maps of the region, in low-lying areas the potentiometric surface of the intermediate aquifer is higher than the waterlevel in the surficial aquifer. Therefore the intermediate moves upward and recharges the surficial aquifer and in these areas and eventually discharges into the Peace River southwest of the Hardee County Landfill. However, the potentiometric surface of the intermediate aquifer decreases as the distance from the river is increased and the above conditions are no longer true.

Based on September 9, 2003 measurements from the two intermediate aquifer supply wells the potentiometric surface of the intermediate aquifer is lower than the surficial aquifer. Consequently, there is a downwardly directed hydraulic gradient between the surficial and the intermediate.

Direction of Groundwater Flow in the Intermediate Aquifer

The direction of lateral flow of groundwater in the intermediate aquifer is indicated by the regional maps of the potentiometric surface prepared by the Southwest Florida Water Management District (SWFWMD). Figures I-6 and I-7 show, respectively, the potentiometric surface for the intermediate aquifer for May 2001 (dry season conditions) and September 2001 (wet season conditions). The general direction of lateral flow in the vicinity of the landfill is southwest toward the Peace River. According to the figures the potentiometric surface during the dry season was 35 feet above NGVD and 70 feet NGVD in the wet season.

Intermediate Aquifer Background Water Quality

According to the 1988 *Ground-Water Resource Availability Inventory of Hardee County* groundwater quality of the intermediate aquifer system is within primary drinking water standards in Hardee County. Fluoride, which is derived from fluorapatite, a principle source of phosphate, occurs in the intermediate aquifer in concentrations ranging from less than 0.8 mg/l to greater than 1.5 mg/l. The secondary drinking water standard for Fluoride is 1.5 mg/l.

No intermediate aquifer monitoring wells are currently located onsite. Therefore no water quality data for the intermediate aquifer have been collected.

FLORIDAN AQUIFER

The Floridan aquifer consists of the Upper and Lower Floridan aquifers that are separated by a middle confing unit. The middle-confining unit and the Lower Floridan aquifer generally contain water high in chlorides therefore very few potable wells penetrate this zone. The Floridan aquifer is composed of continuous sequence of Tertiary carbonate rocks of high permeability that are hydraulically connected to each other. The permeability is several orders of magnitude greater than that of the rocks that bound the system above and below (Ryder, 1982).

The lower unit of the Floridan aquifer consists of limestone and dolomite beds of the Suwannee Limestone, Ocala Group, and Avon Park Limestone which averages more than 800 ft thick in Hardee County.

Direction of Groundwater Flow in the Floridan Aquifer

The direction of lateral flow for groundwater in the Upper Floridan aquifer is indicated by the regional maps of the potentiometric surface prepared by the SWFWMD for the Floridan Aquifer for May and September 2001. The general flow direction in the vicinity of the landfill is southwest. The potentiometric surface in the vicinity of the site during May 2001 was 35 and during September was 70 feet above NGVD. These levels are identical to the potentiometric surface of the intermediate aquifer during the same period.

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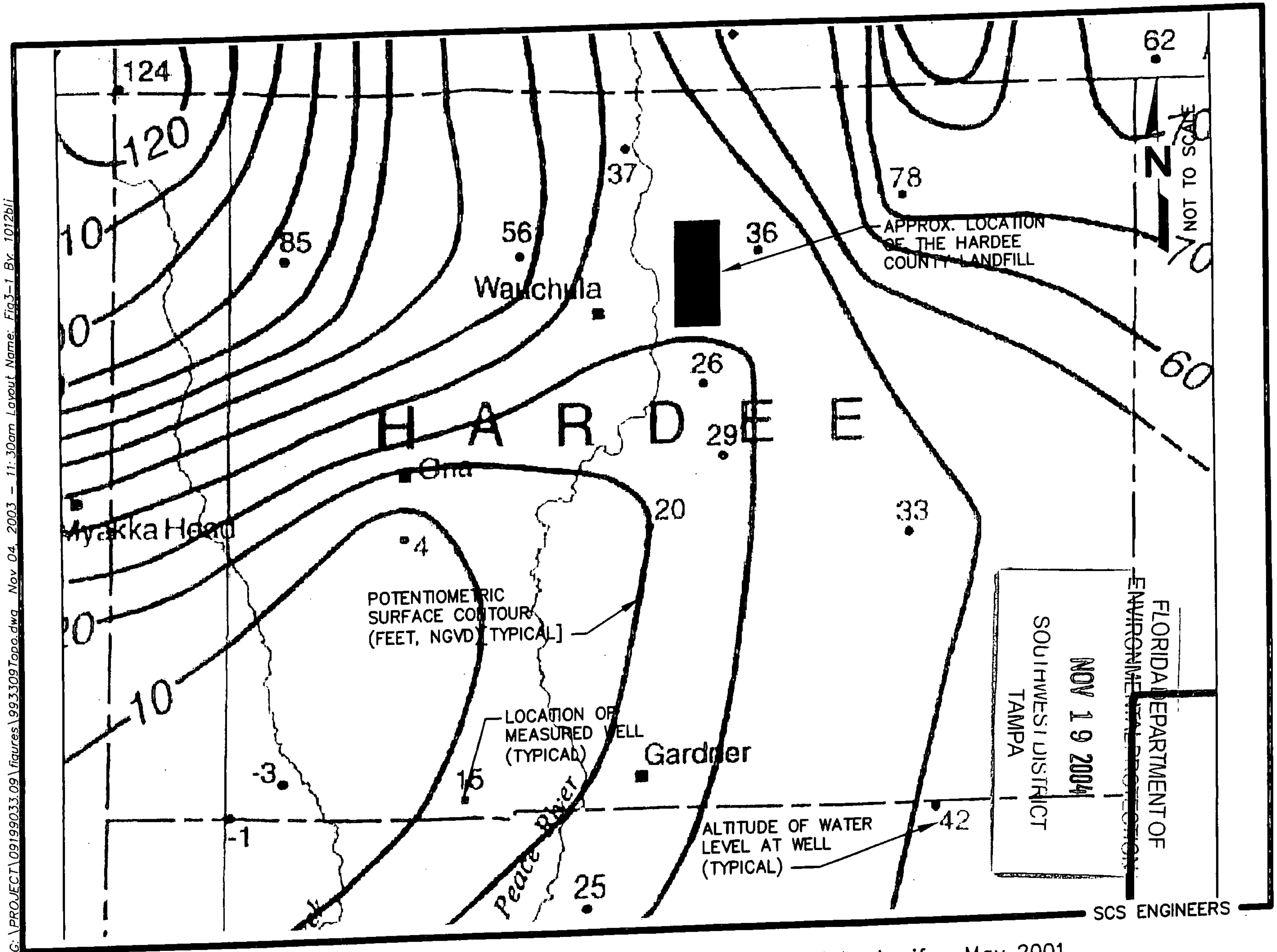

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

Figure I–6. Hardee County Potentiometric Map Intermediate Aquifer, May 2001.

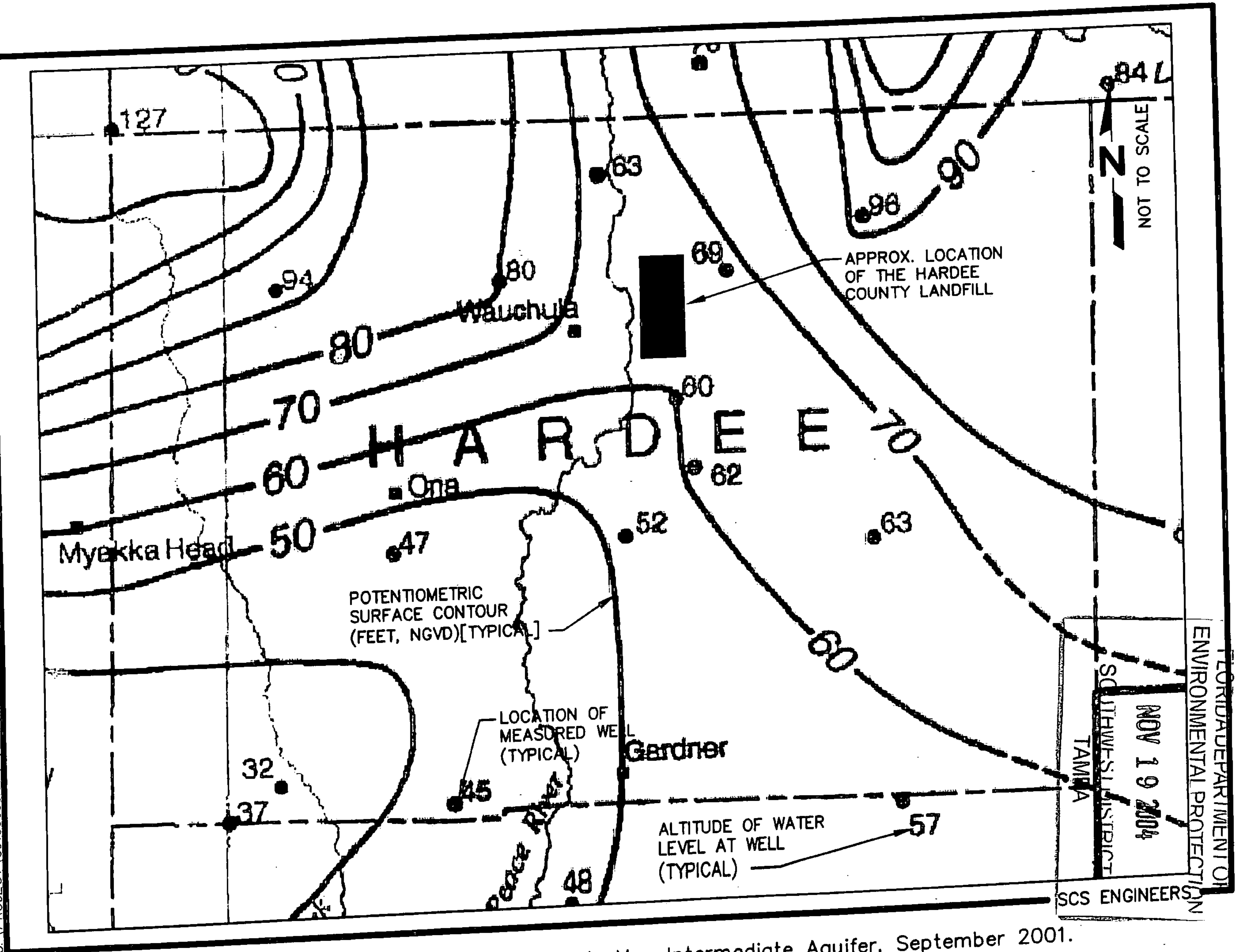

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Figure I-7. Hardee County Potentiometric Map Intermediate Aquifer, September 2001.

Floridan Aquifer Background Water Quality

Groundwater in the Floridan aquifer is generally more mineralized than water from the surficial and intermediate aquifers according to the1988 *Ground-Water Resource Availability Inventory of Hardee County* prepared by the Southwest Florida Water Management District. Major ions concentrations generally are within potable use limits. Dissolved solids concentrations are below the drinking water limit in southern Hardee County.

No Floridan aquifer-monitoring wells are located onsite. Therefore, no water quality data for the Floridan aquifer have been collected.

ON-SITE AQUIFER HYDRAULIC CONNECTIONS

As discussed above, the surficial aquifer is hydraulically separated from the intermediate by a continuous clay layer approximately 10 feet thick. The permeability of the clay layer is 1.1 X 10^{-7} cm/sec according samples collected by SCS in 2003.

There is a downwardly directed hydraulic gradient from the surficial to the intermediate aquifer, indicating the potential for vertical movement of groundwater from the surficial to the intermediate aquifer. The clay layer at the base of the surficial aquifer limits actual movement.

With the exception of the supply well at the maintenance building there are no know penetrations of the confining clay beneath the landfill. This well will be abandoned within 120 days following permit issuance to eliminate the potential connection. An additional supply well will be installed east of the maintenance building approximately 200 feet below land surface

SURFACE WATER

Regional Surface Water Flow Direction

In Hardee County, surface water occurs in rivers, creeks, ponds, and wetlands. The Peace River is the largest drainage system in the County and is located approximately 2,500 feet west of the site. The Peace River flows in a southerly direction about 120 miles from its ~~source in~~ Central Polk County and exits to Charlotte Harbor. According to the 1988 *Ground-Water Resource Availability Inventory of Hardee County,* the Peace River has a drainage area of approximately 1,800 square miles.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT
TAMPA

Hardee County Landfill Stormwater Flow Direction

The on site surface water flow is contributed by stormwater drainage. On site drainage is conveyed by via grass-lined channels, pipes, and detention ponds located on the site.

Stormwater Flow Throughout the Site

Stormwater for the entire site will be treated in the proposed stormwater management area, identified as the Borrow Pit. The Borrow Pit is located on the southern end of the site. The treated stormwater within the Borrow Pit stages up until it is discharged off site via a FDOT (Florida Department of Transportation) Ditch Bottom Inlet. The stormwater then exits the property and travels southwest through a series of offsite water bodies and eventually drains into the Peace River. A Surface Water Drainage Map is shown on Figure I-8.

Stormwater Flow from the Landfill Area

The landfill is drained through a series of channels surrounding the waste disposal unit. The stormwater sheet flows off the landfill into the perimeter channels. Stormwater runoff from the north and east portions of the landfill will be routed, via grass-lined channels, into a stormwater detention pond, identified as the Primary Pond. The treated stormwater from the primary pond drains south into a larger wetland area, denoted as the Bayhead. The Bayhead drains southwest via grass-lined channels and pipes to a Borrow Pit. Stormwater from the southern portion of the landfill will be routed directly to the Borrow Pit via grass-lined channels.

Stormwater Flow from Off-Site

Off-site stormwater flow occurs on the north and east boundaries of the site. The north and east areas consist of cattle pastures. The north off-site flow is treated through a series of two stormwater detention ponds prior to flowing into the Bayhead. The east off-site basin flows directly into the Bayhead. From the Bayhead, the stormwater flow commences as stated above.

Background Surface Water Quality

No background surface water quality is available in the immediate vicinity of the site. Several stations on the Peace River are monitored by the USGS however the nearest station to the site is approximately five miles. According to the 1988 *Ground-Water Resource Availability Inventory of Hardee County* the Zolfo Springs sampling station on the Peace River, where records have been collected since 1964, provide water quality data typical of the water quality in the Peace River throughout Hardee County. The water quality measurements indicate the Peace River is greatly affected by discharge from upstream phosphate operations in Polk County, as indicated by elevated phosphorus and ammonia readings. The overall quality of the Peace River water is adequate for uses such as irrigation and industrial processes.

Onsite Surface Water Quality

Onsite surface water quality is measured at the receiving creek south of the Maintenance Building at SW-1 when surface water is present. This location is shown in Figure I-2 in Attachment I-2. The surface water quality was recently collected on June 13, 2003. The results are provided as Attachment I-4. The results indicate dissolved oxygen does not meet the F.A.C. 62-302 surface water standard of greater than 5.0 mg/l. Dissolved oxygen was detected at 2.40 mg/l.

WELL INVENTORY

An inventory of wells within a one-mile radius of the site is included in Attachment E along with well completion reports. A search of the following Township, Sections, and Ranges within one-mile of the Hardee County Landfill indicate the presence of the and water uses:

Section	Township	Range	Domestic	Irrigation	Public	Other
23	33S	25E	3	2	0	0
24	33S	25E	2	2	0	3
25	33S	25E	6	3	1	0
26	33S	25E	4	0	0	0
27	33S	25E	4	4	1	0
34	33S	25E	2	0	0	0
35	33S	25E	0	1	1	8
36	33S	25E	61	5	2	4
1	34S	25E	23	7	1	4
2	34S	25E	8	3	1	0
3	34S	25E	5	9	0	27

A map of the supply wells within 500 feet of the site is included in Figure I-9. Two supply wells are currently located within the 500-foot radius of the landfill. One supply well is located south of the Maintenance building. This well provides water for toilet flushing and hand washing at the Maintenance building and the Scale house. Bottled water is supplied for drinking purposes. A second supply well is located south of the Material Recycling Facility. It is used within the Material Recycling Facility for fire protection and floor washing. The water is also used at Animal Control Building for cleaning purposes in addition to watering and bathing animals. In order to avoid human consumption all spigots and hose bibs will be labeled "Non-Potable Water Do Not Drink".

Available records indicate there are no community supply wells within 1000 feet of the waste storage and disposal areas.

EXISTING CONTAMINATED AREAS

Based on site history, verbal communication from Janice Williamson, Hardee County Solid Waste Director, and semi-annual groundwater quality data no contaminated media are known to exist at the site.

FLORIDA DEPARTMENT ENVIRONMENTAL PROTECTION
NOV 19 2004
SOUTHWEST DISTRICT TAMPA

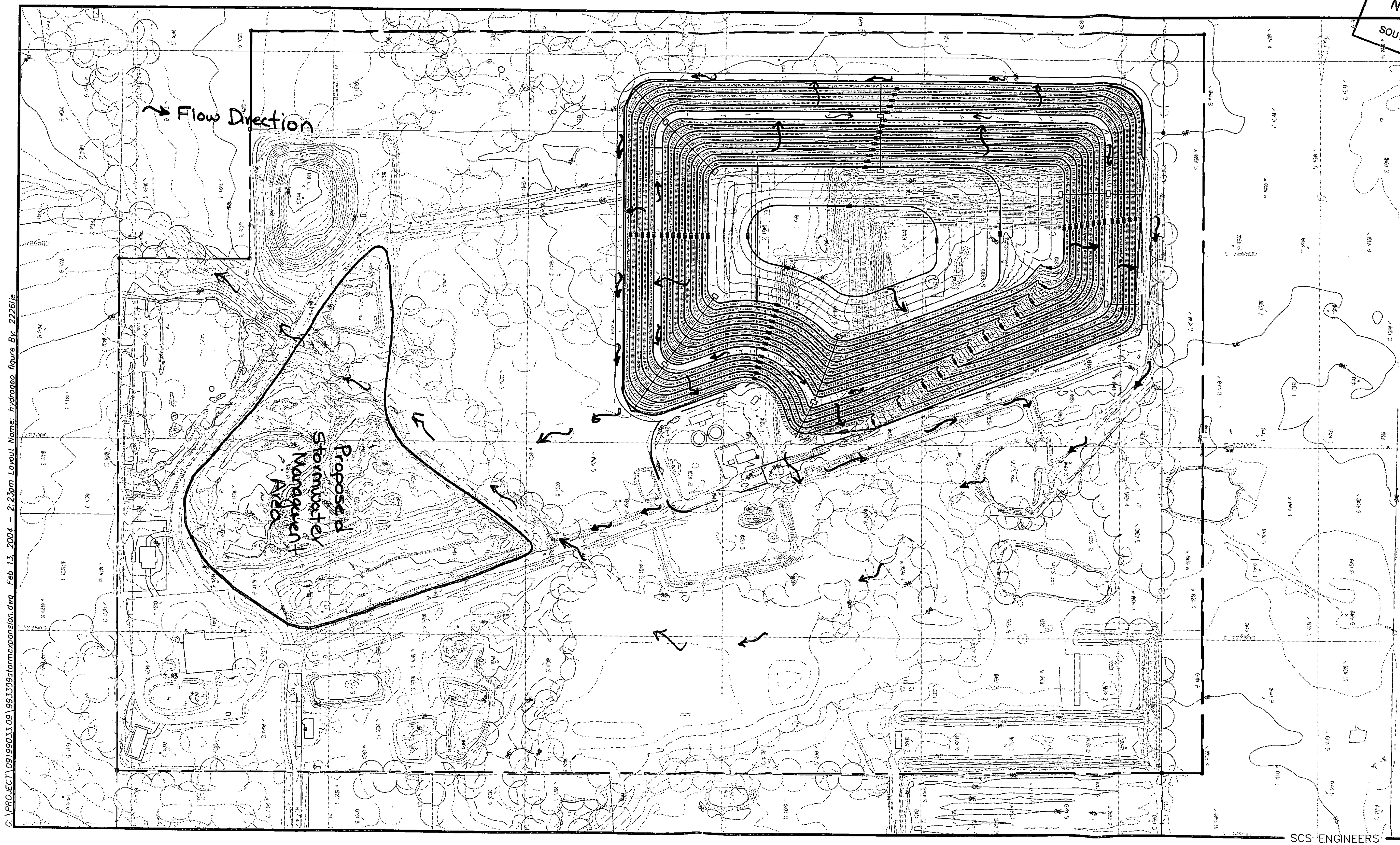

Figure I-8 Surface Water Drainage Map

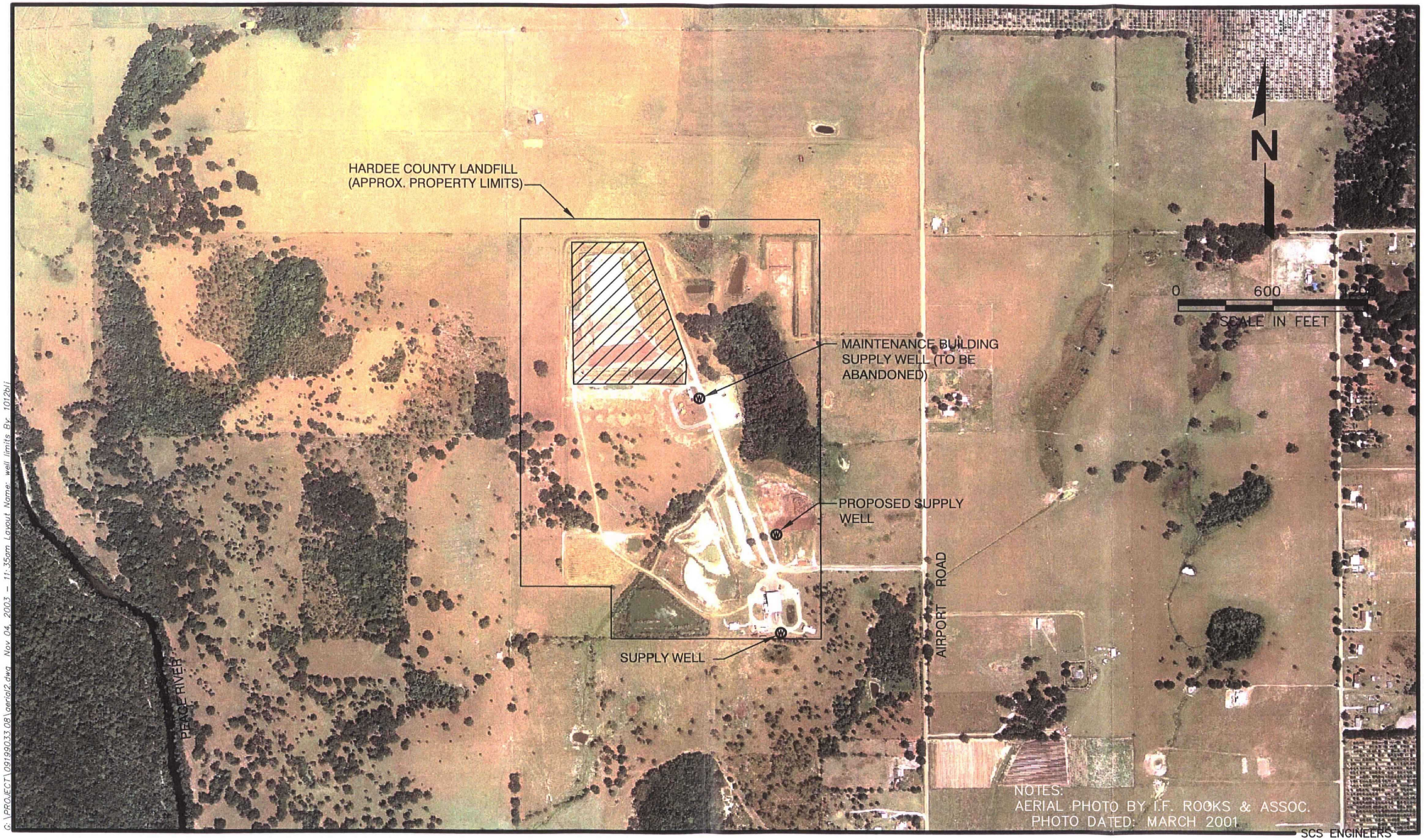

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Figure I–9. Supply Well Location Map, Hardee County Landfill, Hardee County, Florida

REFERENCES

Duer A.G. and Enos G.M., 1991, *Hydrogeology of the Intermediate Aquifer System & Upper Floridan Aquifer, Hardee & DeSoto Counties, Florida:* U.S. Geological Survey Water Resources Investigations Report 90-4104.

Ryder, P.D., 1982 *Digital model of predevelopment flow in the Tertiary limestone (Floridan) aquifer system in West-Central Florida.* U.S. Geological Survey Water – Resources Investigations 81-54

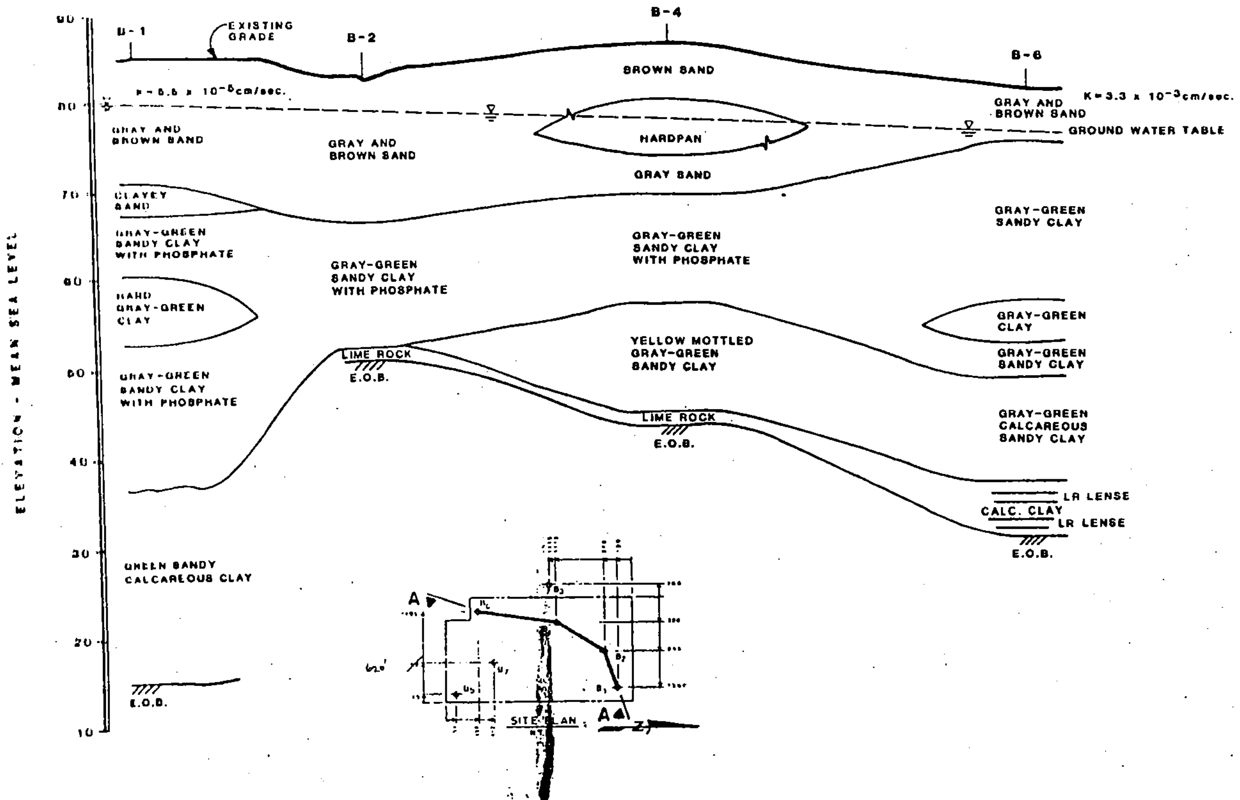
Southwest Florida Water Management District, *Groundwater Resources Availability Inventory Hardee County Florida, 1988*

Todd, K.D. 1980 *Groundwater Hydrology*: John Wiley & Sons Publishing, p55.

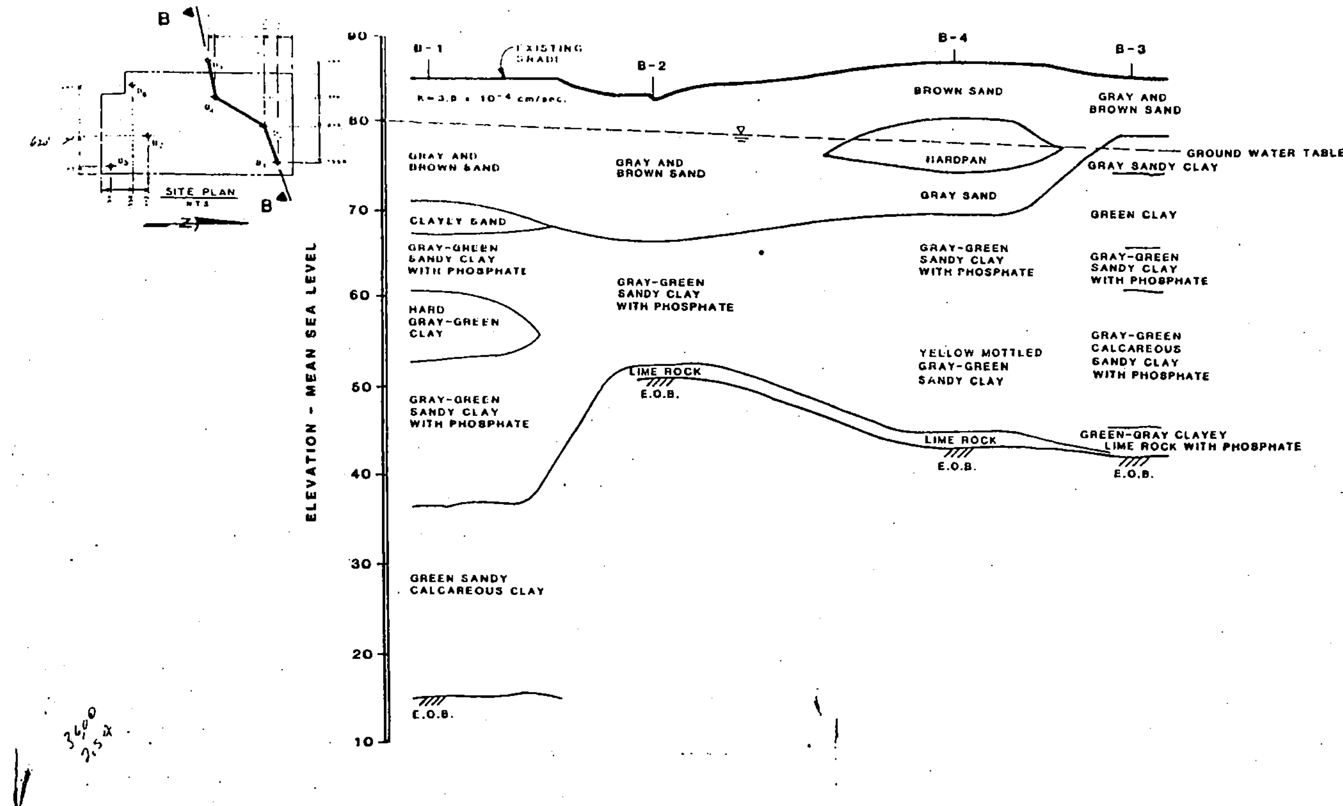
Wilson, W.E., 1977, *Groundwater Resources of DeSoto and Hardee Counties, Florida:* Florida Bureau of Geology Report of Investigations 82, p102

ATTACHMENT I-1

ENVISORS, INC.
TEST BORING RESULTS AND SITE STRATIGRAPHY



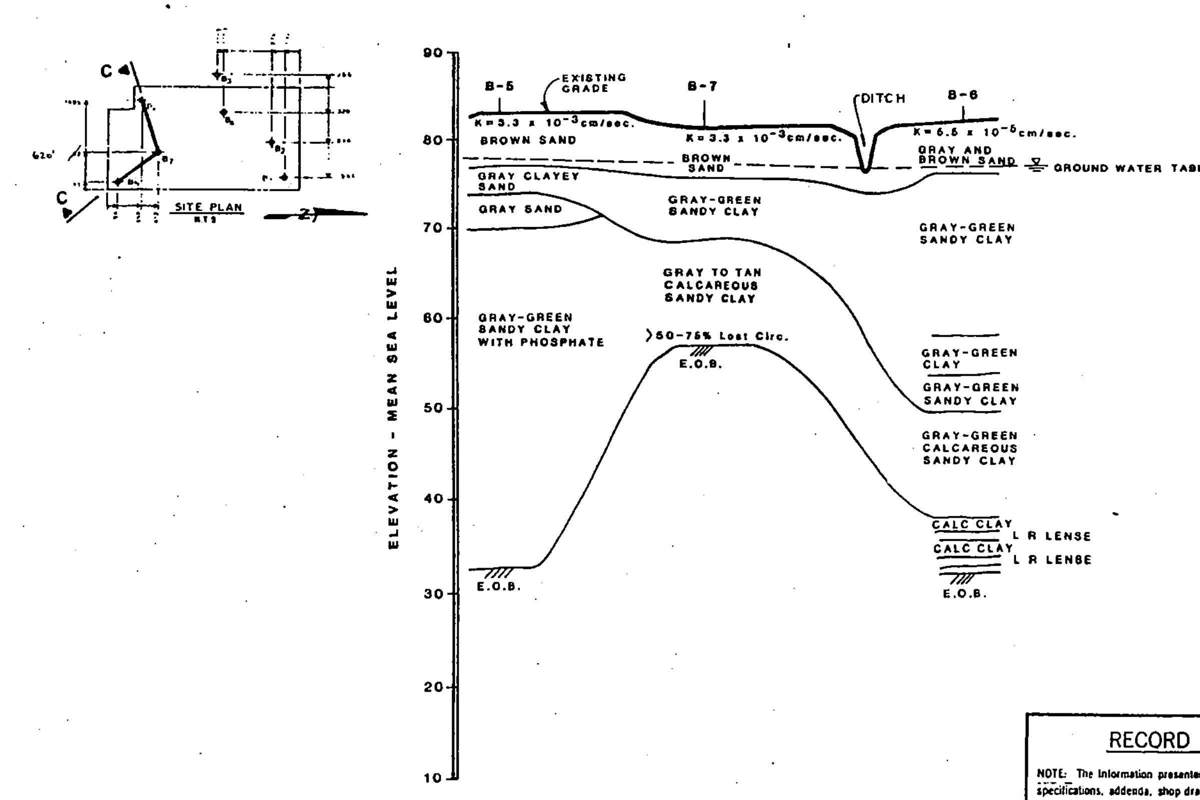
SECTION A-A



SECTION B-B

NOTES: 1.) ALL SUBSURFACE SOILS WORK CONDUCTED BY ARMAC ENGINEERING, INC., TAMPA, FLORIDA

2.) SUBSURFACE CONDITIONS BETWEEN BORING LOCATIONS ARE INTERPOLATED.



SECTION C-C

RECORD DRAWING

NOTE: The information presented hereon is based upon drawings, specifications, addenda, shop drawings, modifications, etc. annotated by the contractor during the construction period to reflect the in-situ parameters of the improvements he constructed.

The Engineer, Envisors, Inc., is not responsible for the accuracy or validity of the Record Drawing information depicted hereon.

HARDEE COUNTY, FLORIDA

REGIONAL SANITARY LANDFILL

SOILS INFORMATION

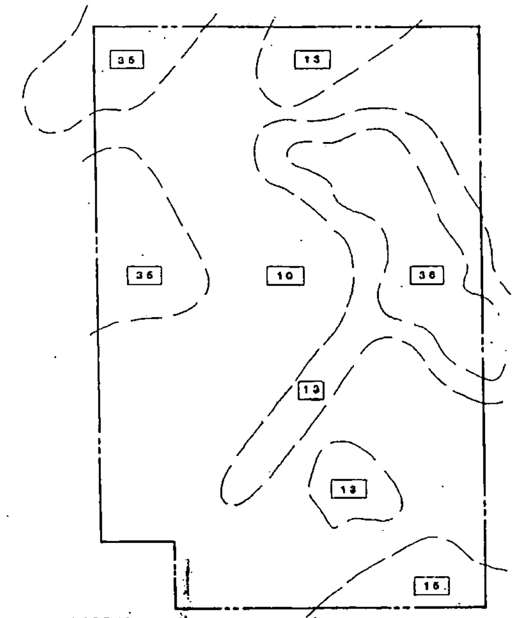
Florida Registered Professional Engineer No. 13097

Designed	—
Drawn	C.S.L.
Checked	D.D.
Approved	D.D.
Job No	81014
Date	10/82

No.	Revision Description	By	Chk.	Date
1	New Sheet	CSL	DD	1/8/83

EVI ENVISORS, Inc.
Consulting Civil & Environmental Engineers
Economists, and Planners
WINTER HAVEN, TAMPA, & MARGATE, FLORIDA

SHEET NUMBER 4 OF 14



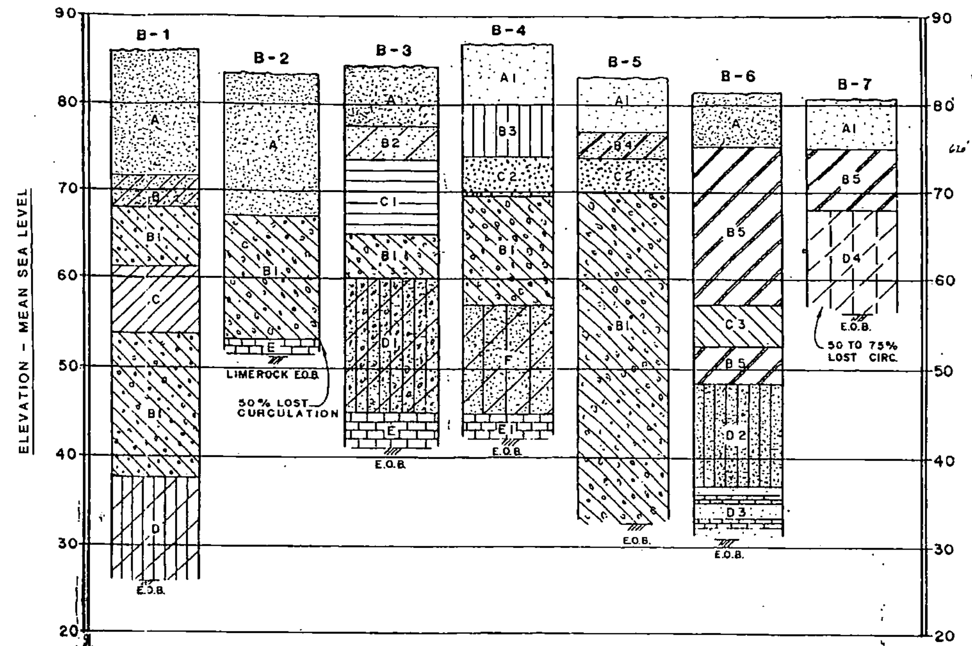
LEGEND

- 10 POMONA FINE SAND
- 13 FLORIDANA MUCKY FINE SAND, DEPRESSIONAL
- 15 IMMOKALEE FINE SAND
- 35 OLDSMAR FINE SAND
- 36 TOMOKA MUCK
- SITE BOUNDARY
- LIMITS OF SPECIFIC SOILS ASSOCIATION

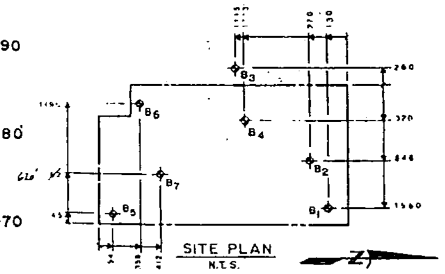
Reference: Interim Soil Survey Report, Maps and Interpretations by U.S.D.A. Soil Conservation Service.

SCALE
1"=400'

SURFACE SOILS ASSOCIATIONS PLAN



SOIL BORING PROFILES

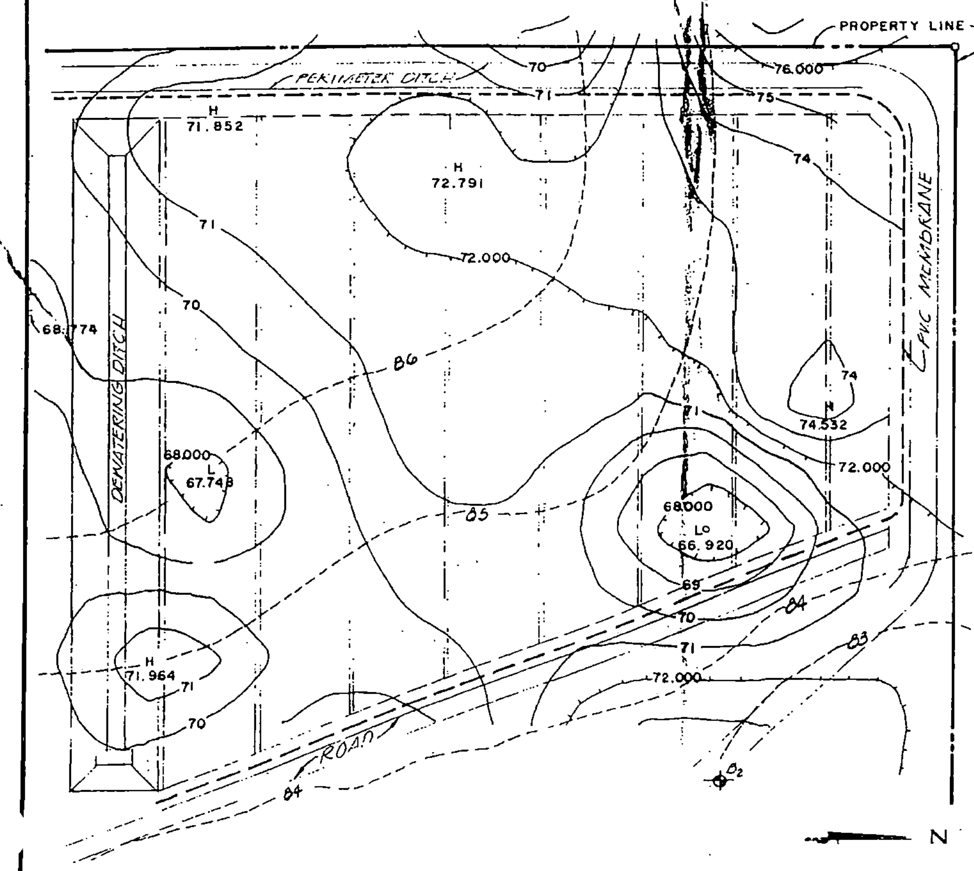


SITE PLAN
N.T.S.

LEGEND

A	GRAY & BROWN SAND
A1	BROWN SAND
B	CLAYEY SAND
B1	GRAY-GREEN SANDY CLAY W/ PHOSPHATE
B2	GRAY SANDY CLAY
B3	HARDPAN
B4	GRAY CLAYEY SAND
B5	GRAY-GREEN SANDY CLAY
C	HARD GRAY-GREEN CLAY
C1	GREEN CLAY
C2	GRAY SAND
C3	GRAY-GREEN CLAY
D	GREEN SANDY CALCAREOUS
D1	GRAY-GREEN CALCAREOUS SANDY CLAY W/ PHOSPHATE
D2	GRAY-GREEN CALCAREOUS
D3	GRAY-GREEN CALCAREOUS CLAY W/ L.R. LENSES
D4	GRAY TO TAN CALCAREOUS SANDY CLAY
E	GREENISH GRAY CLAYEY LIMEROCK W/ PHOSPHATE
E1	GREENISH GRAY LIMEROCK & SANDY CLAY
F	YELLOW MOTTLED GRAY-GREEN SANDY CLAY

NOTE: ALL SUBSURFACE SOILS WORK CONDUCTED BY ARMAC ENGINEERING, INC., TAMPA, FLORIDA.



NOTES

1) THIS FIGURE REPRESENTS THE RESULTS OF A REFRACTION SEISMIC SURVEY OF THE NORTHWEST CORNER OF THE SITE, PERFORMED BY ARMAC ENGINEERS, INC., 8430 NORTH 40TH STREET, TAMPA, FLORIDA 33604. THIS SURVEY WAS PERFORMED IN ORDER TO ESTABLISH THE EXISTENCE OF AND ESTIMATE THE DEPTH TO THE UNDERLYING CONFINING CLAY LAYER. CORRELATION WITH KNOWN SOIL DEPTH DATA WAS ESTABLISHED BY PERFORMING THE SURVEY IN CLOSE PROXIMITY TO PREVIOUSLY PERFORMED SPT BORINGS B-2 AND B-4. CHARACTERISTIC COMPRESSIVE WAVE VELOCITIES WERE ESTABLISHED FOR BOTH THE UPPER SURFICIAL SOILS AND UNDERLYING CLAY SOILS. THESE AVERAGE COMPRESSION WAVE VELOCITIES WERE FOUND TO BE 1362 AND 4824, RESPECTIVELY. THIS HIGH VELOCITY DIFFERENTIAL WAS USED TO IDENTIFY THESE SEPARATE SOIL STRATA.

THE FIGURE SHOWS THE RESULTS OF THIS SEISMOGRAPH INVESTIGATION WHICH INDICATE THAT THE UNDERLYING COHESIVE CLAY LAYER IS ESTIMATED TO LIE AT DEPTHS RANGING FROM ABOUT 8.4 TO 18.0 FEET BELOW GROUND SURFACE (ELEVATION 67.8 TO 77.3 FEET MSL). THE COHESIVE SOIL STRATA WAS FOUND TO BE CONTINUOUS IN THE SUBJECT AREA, BUT POSSIBLE HIGH VELOCITY HARDPAN OR SURFICIAL CLAY LAYERS WERE FOUND TO EXIST AT THREE OUT OF 22 SURVEY GRID LOCATIONS. THESE NEAR-SURFACE HIGH VELOCITY SOIL LAYERS PRODUCED ANOMALOUS WAVE REVERSALS PREVENTING DEEPER SOIL ANALYSIS AT THESE LOCATION.

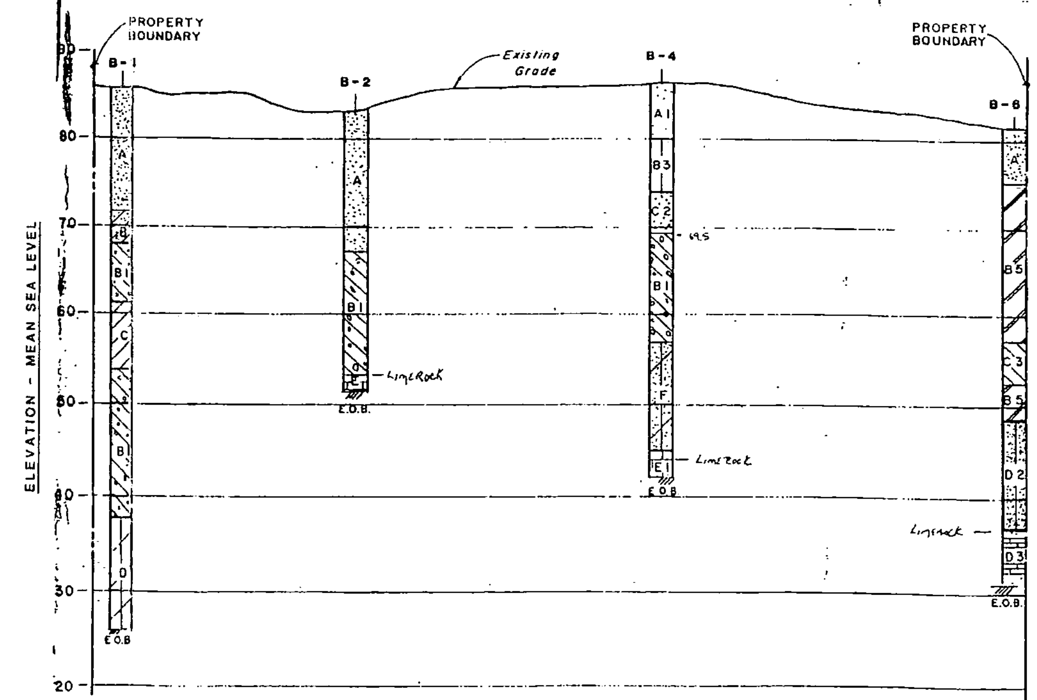
2) CLAY CONTOURS AT ONE FOOT (1') INTERVALS.

LEGEND

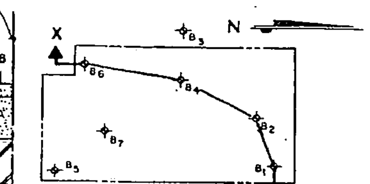
- —68.000— SUBSURFACE CLAY CONTOUR W/ELEVATION
- L LOW CLAY
- H HIGH CLAY
- --86-- GROUND CONTOUR
- BORING LOCATION
- ------ IMPERMEABLE PVC MEMBRANE BARRIER

N

CLAY LAYER ELEVATIONS
SCALE: 1" = 100'



SECTION X-X



SITE PLAN
N.T.S.

LEGEND

A	GRAY & BROWN SAND
A1	BROWN SAND
B	CLAYEY SAND
B1	GRAY-GREEN SANDY CLAY W/ PHOSPHATE
B2	GRAY SANDY CLAY
B3	HARDPAN
B4	GRAY CLAYEY SAND
B5	GRAY-GREEN SANDY CLAY
C	HARD GRAY-GREEN CLAY
C1	GREEN CLAY
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D1	GRAY-GREEN CALCAREOUS SANDY CLAY W/ PHOSPHATE
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D3	GRAY-GREEN CALCAREOUS CLAY W/ L.R. LENSES
D4	GRAY TO TAN CALCAREOUS SANDY CLAY
E	GREENISH GRAY CLAYEY LIMEROCK W/ PHOSPHATE
E1	GREENISH GRAY LIMEROCK & SANDY CLAY
F	YELLOW MOTTLED GRAY-GREEN SANDY CLAY

D.E.P.
JUN - 6 1997
TAMPA

RECORD DRAWING

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The Engineer, Envisors, Inc., is not responsible for the accuracy or validity of the Record Drawing information depicted hereon.

HARDEE COUNTY, FLORIDA
REGIONAL SANITARY LANDFILL

SOILS INFORMATION

Florida Registered Professional Engineer No. 13097

Designed	—				
Drawn	C.S.L.				
Checked	D. D.				
Approved	D. D.				
Job No	81014	1	New Sheet	CSL	DD
Date	10/82	No.	Revision Description	By	Chk.

ENVISORS, Inc.
Consulting Civil & Environmental Engineers
Economists, and Planners
WINTER HAVEN, TAMPA, & MARGATE, FLORIDA

SHEET NUMBER
3
OF 14 SHEETS

ATTACHMENT I-2

BIENNIAL GROUNDWATER MONITORING PLAN EVALUATION
HARDEE COUNTY LANDFILL
HARDEE COUNTY, FLORIDA

BIENNIAL
GROUNDWATER MONITORING PLAN
EVALUATION
HARDEE COUNTY LANDFILL
HARDEE COUNTY, FLORIDA

Prepared by:

SCS Engineers
3012 U.S. Highway 301, North, Suite 700
Tampa, FL 33619
(813) 621-0080

Prepared for:

Hardee County Board of County Commissioners
685 Airport Road
Wauchula, FL 33873

May 12, 2003
File No. 09199033.07

Robert L Wetter
5/12/03

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Figures

Tables

Attachments

SECTION 1

INTRODUCTION

BACKGROUND

The current Florida Department of Environmental Protection (FDEP) permit (Permit Number 38414-002-SO), to operate a Class I landfill, approximately 12.5 acres at the Hardee Landfill, expires on November 19, 2003. Specific Condition No. 38 of the permit requires that "every two years and prior to 90 days before the expiration of the Permit, the permittee shall submit an evaluation of the Groundwater Monitoring Plan as per Rule 62-701.510 (9) (b), F.A.C. and shall include assessment of the effectiveness of the existing landfill design and operation as related to the prevention of groundwater contamination." SCS Engineers (SCS) is submitting this groundwater monitoring evaluation on behalf of Hardee County to fulfill these permit conditions. This evaluation includes data for the period June 1999 to December 2002 (referred to as the "period of record").

REQUIREMENTS OF F.A.C. 62-701.510(9)(B)

The requirements of F.A.C. 62-701.510(9)(b) include the following:

1. Tabular and graphical displays of any data which show that a monitoring parameter has been detected, including hydrographs for all monitoring wells.

2. Trend analyses of any monitoring parameters detected.

3. Comparisons among shallow, middle, and deep zone wells.

4. Comparisons between up gradient and down gradient wells.

5. Correlation between related parameters such as total dissolved solids and specific conductance.

6. Discussion of erratic and/or poorly correlated data.

7. An interpretation of the groundwater contour maps, including an evaluation of groundwater flow rates.

8. An evaluation of the adequacy of the water quality monitoring frequency and sampling locations based upon site conditions.

The following sections of this biennial report address each of the above requirements, although not necessarily in the order listed. The evaluation includes groundwater data from June 1999 to December 2002. Section 5.0 of this report is an assessment of the effectiveness of the existing landfill design and operation as it applies to the prevention of groundwater contamination.

HISTORY

Prior to 1998, leachate was collected south of the waste disposal area using a drainage ditch system. The leachate was then spray irrigated south of the leachate containment ditch. This system was discontinued and the leachate ditch was subsequently incorporated into the southern portion if the landfill. Currently, Hardee County disposes of leachate through the City of Wauchula Wastewater Treatment Facility. The approximate locations of the dewatering ditch (leachate containment area) and spray field (no longer used) are shown on Figure 1-1. The figure was provided in the previous Hardee County Permit (1993) by Seaburn and Robertson, Inc.

Permit Figure 1.

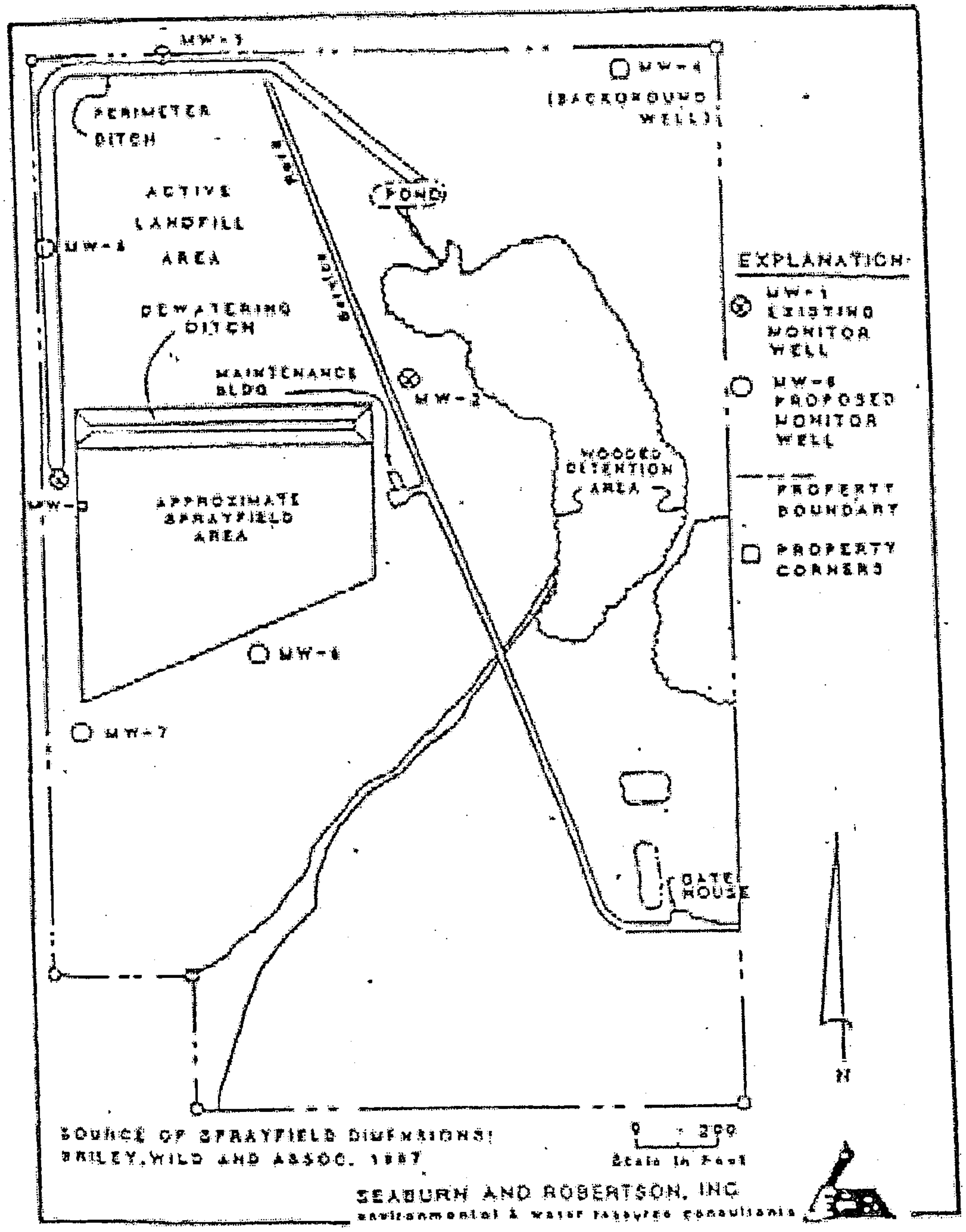


FIGURE 1.- LOCATION OF MONITOR WELLS.

Figure 1-1 Location of former Leachate dewatering ditch and spray field

SECTION 2

SUMMARY OF THE GROUNDWATER MONITORING PROGRAM

Water quality monitoring at the Hardee County Landfill is conducted at six groundwater sites (MW-1, MW-2, MW-4, MW-5, MW-8, and MW-9), one leachate site (Manhole 1), and one surface water site (SW-1). Groundwater levels are measured semi-annual at MW-1, MW-2, MW-4, MW-5, MW-6, MW-7, MW-8, and MW-9 and at ten piezometers. All monitoring points are shown on Figure 2-1. Eleven piezometers were included in the current permit; however, P-6 was abandoned and has not been replaced.

GROUNDWATER QUALITY MONITORING

Groundwater quality monitoring for the Hardee County landfill consists of six-groundwater monitoring wells, one leachate site, and one surface water site.

GROUNDWATER MONITORING WELLS

As established in the current permit, the groundwater-monitoring program consists of the monitoring wells listed in Table 2-1.

TABLE 2-1. GROUNDWATER MONITORING WELLS AT THE HARDEE COUNTY LANDFILL

Well Number	Aquifer Monitored	Permit Designation
MW-1	Surficial	Detection
MW-2	Surficial	Detection
MW-4	Surficial	Background
MW-5	Surficial	Detection
MW-8	Surficial	Detection
MW-9	Surficial	Detection

The monitoring program includes one designated background well (MW-4) and five designated detection wells (MW-1, MW-2, MW-5, MW-8 and MW-9).

GROUNDWATER QUALITY PARAMETERS

The current Groundwater Quality Parameters requires semi-annual sampling of MW-1, MW-2, MW-4, MW-5, MW-8 and MW-9 for the field and laboratory parameters listed below. Per Specific Condition 34 of the current permit, semi-annual water levels and field conductance are required at groundwater monitoring wells MW-6 and MW-7, located down gradient of the former spray field (shown on Figure 2-1).

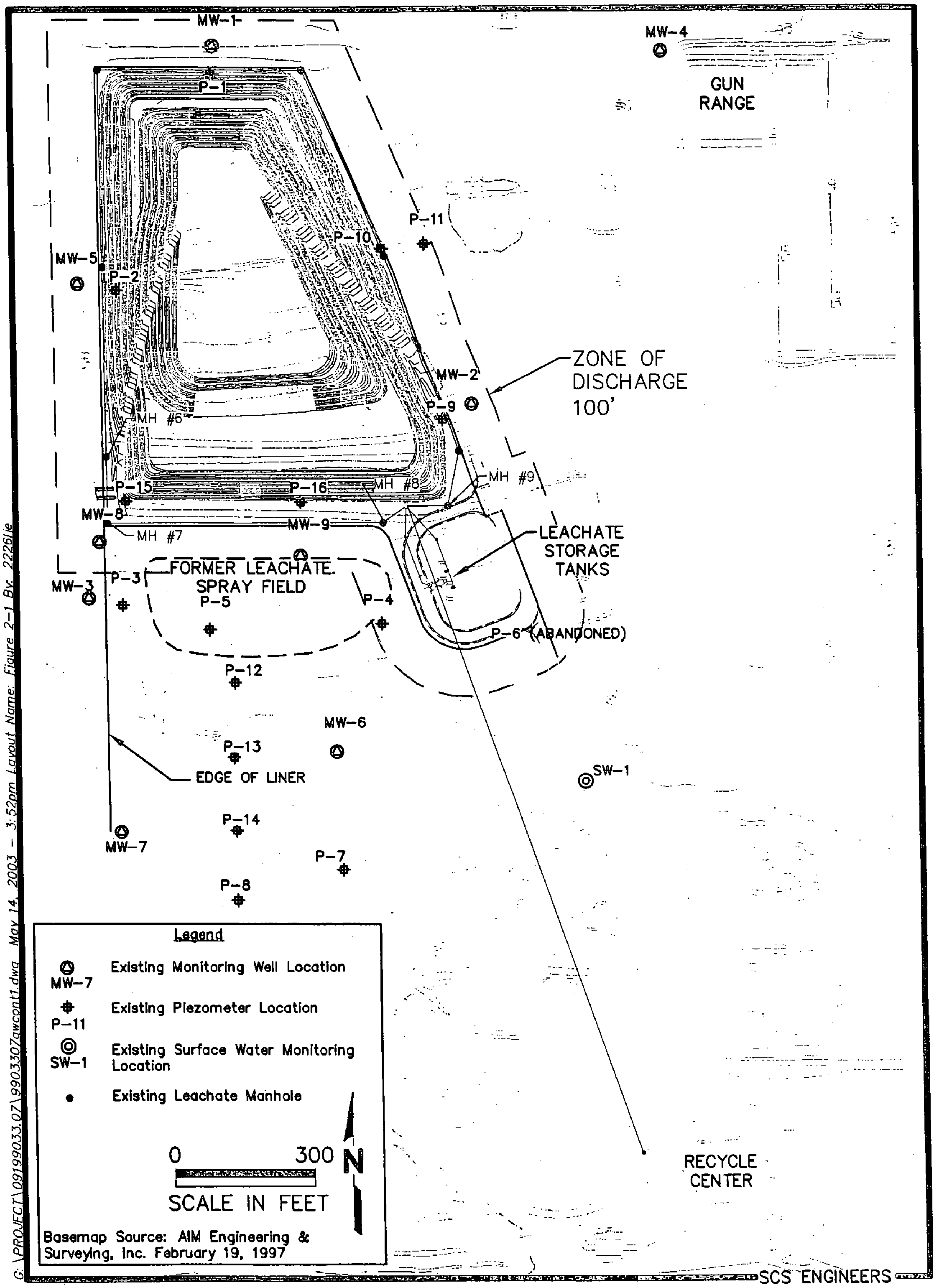


Figure 2–1. Overall Site Map, Hardee County Solid Waste Disposal Facility

FIELD PARAMETERS

- Static water level before purging
- Specific Conductivity
- pH
- Dissolved Oxygen
- Turbidity
- Temperature
- Color and Sheen by observation

LABORATORY PARAMETERS (UNFILTERED)

- Total Ammonia -N
- Chlorides
- Iron
- Mercury
- Nitrate
- Sodium
- Total Dissolved Solids (TDS)
- Parameters listed in 40 CFR part 258, Appendix I

GROUNDWATER LEVEL MONITORING

Groundwater levels are measured in the groundwater monitoring wells and in the ten piezometers located around the Hardee County landfill semi-annually. Construction characteristics and top of casing elevations for the groundwater monitoring wells are shown in Table 2-2.

LEACHATE MONITORING

Leachate samples are to be collected at Manhole 1 semi-annually. However Manhole 9, which is hydraulically down gradient from Manhole 1, is used as an alternative sampling site when Manhole 1 is dry.

LEACHATE PARAMETERS

The permit requires semi-annual sampling for the field and laboratory parameters listed below.

FIELD PARAMETERS

- Specific Conductivity

Table 2-2 Hardee County Monitoring Well Construction Details

Well ID	Well Diameter	Well Designation	Total Depth (bls)	Casing Length (ft)	Screen Length	TOC Elevation (NGVD)	Ground Surface Elevation (Ft-NGVD)	screen top/bottom (ft. bls)	screen top/bottom (NGVD)	Maximum Water Level (NGVD)	Minimum Water Level (NGVD)
MW-1	4"	Detection	11.00'	7.80'	5'	87.97	86.24	7.0/11.0	79.24/75.24	85.44 (Feb 95)	78.27 (June 00)
MW-2	4"	Detection	10.50'	7.80'	5'	85.86	83.75	5.5/10.5	81.25/73.25	82.46 (Dec 02)	75.56 (June 00)
MW-4	2"	Background	18.90'	12.20'	10'	87.16	84.09	8.9/18.9	75.19/65.19	83.06 (Dec 02)	76.56 (June 00)
MW-5	2"	Detection	18.10'	11.00'	10'	88.76	85.83	8.1/18.1	77.73/67.73	82.91 (Dec 97)	76.46 (June 00)
MW-8	2"	Detection	13.50'	3.50'	10'	88.98	85.80	3.5/13.5	82.30/72.30	83.18 (Dec 02)	75.58 (June 01)
MW-9	2"	Detection	13.50'	3.50'	10'	88.71	85.90	3.5/13.5	82.40/72.40	83.11 (Dec 02)	75.31 (June 01)

- pH
- Dissolved Oxygen
- Color and Sheen by observation

LABORATORY PARAMETERS (UNFILTERED)

- Total Ammonia -N
- Bicarbonate
- Chlorides
- Iron
- Mercury
- Nitrate
- Sodium
- Total Dissolved Solids (TDS)
- Parameters listed in 40 CFR part 258, Appendix I

In addition to the above-mentioned parameters, leachate is to be sampled annually for parameters listed in 40 CFR part 258, Appendix II.

SURFACE WATER MONITORING

Surface water samples are required to be collected semi-annually from location SW-1. However, during the reporting period no surface water was present at SW-1.

SURFACE WATER PARAMETERS

When surface water is present at SW-1, the following parameters are required for analysis:

FIELD PARAMETERS

- Specific Conductivity
- pH
- Dissolved Oxygen
- Temperature
- Color and Sheen by observation

LABORATORY PARAMETERS (UNFILTERED)

- Zinc
- Unionized Ammonia
- Total Hardness
- Biochemical Oxygen Demand (BOD)
- Copper
- Iron

- Mercury
- Nitrate
- Total Dissolved Solids (TDS)
- Total Organic Carbon (TOC)
- Fecal Coliform
- Total Phosphorous
- Chemical Oxygen Demand (COD)
- Total Suspended Solids (TSS)
- Those Parameters listed in 40 CFR part 258, Appendix I

SECTION 3

WATER QUALITY MONITORING DATA FINDINGS

This section summarizes water quality data for the period of record. Attachment A lists water quality data for each monitoring well for the period of record. The groundwater tables include values above the method detection limits (MDL) for FDEP drinking water standards listed in F.A.C. Chapter 62-550. The tables also include groundwater cleanup target levels, as listed in Chapter 62-777, F.A.C., for parameters that do not have primary and secondary drinking water standards. Attachment B includes trend analyses charts for constituents that were detected above the maximum concentration limit (MCL) for the applicable groundwater standards or that were consistently detected above the MDL in groundwater samples.

Semi-annual data for leachate monitoring is also shown in Attachment C. The data was compared to the toxicity standards listed in 40 CFR part 258, Appendix II, in addition to primary and secondary drinking water standards, Chapter 62-550 F.A.C., groundwater cleanup target levels, Chapter 62-777, F.A.C., and surface water standards Chapter 62-302, F.A.C.

Samples were collected and analyzed for the parameters identified in the FDEP permit by Short Environmental Laboratory in accordance with F.A.C. Chapter 62-160 and F.A.C. 62-701.510(2) (b). The monitoring data discussed in this include the following sampling dates:

- June 1999
- December 1999
- June 2000
- December 2000
- June 2001
- December 2001
- June 2002
- December 2002

Surficial aquifer monitoring wells MW-8 and MW-9 were not sampled during the June 1999 and the December 1999 semiannual sampling events because they were not installed until April 2000. Also, surficial monitoring wells MW-6 and MW-7 were sampled for field conductivity as required by Specific Condition 34.

GROUNDWATER

The analytical data collected for the six on-site groundwater-monitoring wells were evaluated for the period of record, regulatory exceedances and trends are discussed below.

Regulatory Exceedances and Trend Analysis

Attachment B includes trend analyses charts compiled from the exceedances data tables. Trend analyses charts were developed for leachate key indicator parameters and for those constituents with concentrations in excess of the FDEP groundwater standards or criteria.

Constituents detected in groundwater samples at concentrations above FDEP primary and secondary drinking water standards and FDEP Groundwater cleanup target levels include iron, vanadium, and pH. Exceedances for iron and pH were detected in both background and detection monitoring wells. Discussions of the trends for those parameters that exceed the regulatory criteria from the eight sampling events during the monitoring period are provided below.

Groundwater Quality Trend Analysis

Iron – Iron was consistently detected above the Secondary Drinking Water Standard (SDWS) of 300 ug/L in surficial monitoring wells MW-1, MW-2, MW-4, and MW-5, MW-8 and MW-9. Iron was detected in substantially higher concentrations in up gradient wells, MW-1 and MW-4 than in the cross gradient wells and down gradient wells. There were no definitive trends in iron concentrations observed during the reporting period. However, iron is a naturally occurring element and has been detected in the surficial aquifer in this region at concentrations of 43,900 µg/l, according to the Florida Geological Survey (FGS) Special Publication No. 34.

pH (field)– pH measurements consistently have been outside (below) of the SDWS range of 6.5-8.5 in all on-site surficial monitoring wells, including the surficial aquifer background monitoring well, MW-4. There were no definitive trends in pH concentrations observed during the reporting period.

Dissolved Oxygen (DO) (field)- During the June 1999 sampling event field DO at MW-2 was detected at 25.8 mg/l. At Temperatures of 0°-30° Celsius, DO should only range from 1-17 mg/L. This reading appears to be erroneous and may be due to field calibration error.

Turbidity (field)- Field turbidity is elevated at various sites during the period of record. On Dec 2001 the turbidity at MW-8 was measured at 364 NTUs. This value appears to be erroneous as no other parameters indicates this increase in turbidity. This is most likely due to field calibration error or sampling technique. Short Environmental Laboratories collected groundwater samples using bailers until June 2002. This sampling technique may cause increase turbidity in the sample. The use of bailers has since been replaced with pumps.

Vanadium – Although not a PDWS nor SDWS, vanadium was detected above the Groundwater Cleanup Target Level (GCTL) of 49 ug/L in surficial monitoring well MW-9 during the June 2001 monitoring event. The method detection limit (MDL) for vanadium during the reporting period was in excess of the maximum contamination limit (MCL); therefore, no trend can be assessed at this time.

Correlation between parameters and data--

Graphs of concentration versus time for TDS and conductivity are included in Attachment D. TDS and conductivity values appear to be increasing at detection well MW-6 and background well MW-4. The reason for the trend is unknown but may be related to natural conditions. These trends will be further assessed during the next biennial reporting period.

Conductivity in monitoring well MW-8 appears to be trending upward while TDS is trending downward. The results may be due to either field error or laboratory error, generally trends for field conductivity and TDS values coincide. The most notable differences occurred during in June 2000. During this sampling event TDS decreased at MW-4, MW-5 and MW-8 while conductivity increased. Field and lab protocols will be evaluated to further assess these trends.

LEACHATE

The analytical data for leachate was collected and analyzed for the previously mentioned parameters, the evaluation of leachate data is discussed below.

Leachate Results and Regulatory Exceedances

Leachate monitoring is described in Specific Condition 31 of the permit. Leachate is monitored through the collection of leachate samples from Manhole 1. However Manhole 9 is commonly sampled because Manhole 1 is frequently dry during the semi-annual events. Attachment C summarizes leachate data for the period of record. There were no exceedances of the 40 CFR Chapter I-Part 261 Toxicity Characteristics.

Surface Water

The surface water system is described in Specific Condition 32 of the permit. Surface water is monitored through the collection of surface water samples from one sampling location:

- SW-1

Due to low surface water conditions samples could not be obtained for any of the sampling events included in the reporting period therefore no trend analysis is necessary.

SECTION 4

GROUNDWATER LEVELS AND FLOW ASSESSMENT

Groundwater levels were evaluated at eight groundwater-monitoring wells and ten piezometer on-site in order to evaluated groundwater flow and velocity. The findings are discussed below.

POTENTIOMETRIC MAPS AND HYDROGRAPHS

Groundwater flow assessment measurements were conducted for the surficial aquifer for each of the previous monitoring periods extending from June 1999 through December 2002. The assessment activities included the collection of groundwater monitoring depth intervals and the calculation of groundwater elevations in the site monitoring wells and piezometers. These data have been plotted on site figures to assess groundwater flow direction. Copies of the potentiometric maps generated for each monitoring event are presented in Attachment E. The potentiometric flow maps were generated using Surfer 7.0. The groundwater elevations for the period of record are shown in Table 4-1.

The estimated groundwater flow direction during the period of record in the surficial aquifer is south to southeast with exception to December 2002 (Figure E-8). The landfill liner affects the groundwater flow in the vicinity of the landfill. The north side of the landfill, consisting of a PVC liner while the remaining southern portion of the landfill is a HDPE liner. By design groundwater is not allowed to flow through the liner therefore flow is diverted along the outer wall.

Hydrographs depicting the groundwater elevations within each well for each sampling event over the monitoring period were generated and presented in Attachment E. The groundwater level calculations indicated higher groundwater table elevations in the December monitoring events and lower groundwater table elevations in the June monitoring events. These data are consistent with previous biennial reporting data and reflect rainfall conditions.

HYDROGEOLOGY AND HYDRAULIC CHARACTERISTICS

A hydrogeological investigation, dated March 17, 1993 was performed by Mevers and Associates. This report indicated that the Hardee County landfill site is underlain by a 10 to 15- foot thick surficial aquifer consisting mainly of fine sand to clayey fine sand. These results were consistent with the site soil conditions reported be Envisors, Inc. in 1982. The lithologic logs as prepared by Envisors, Inc., 1982 are provided as Attachment F. According to Envisors, Inc (1982), the surficial aquifer is separated from the deeper Floridan Aquifer by a continuous confining clay layer that varies in thickness from 14 feet to 35 feet with an average thickness of approximately 25 feet thick. Based on field permeability testing, Mevers found the surficial aquifer to have an average horizontal permeability of about 5 feet per day, the porosity of the upper sands was estimated to be 0.2.

Table 4-1 Groundwater Elevations for the Piezometers and Groundwater Monitoring Wells located at the Hardee County Landfill

June 1999 through December 2002

Location	Top of Casing Elevation (NGVD)	6/1/1999 GW Elevation (NGVD)	12/6/1999 GW Elevation (NGVD)	6/8/2000 GW Elevation (NGVD)	12/6/2000 GW Elevation (NGVD)	6/6/2001 GW Elevation (NGVD)	12/10/2001 GW Elevation (NGVD)	6/10/2002 GW Elevation (NGVD)	12/16/2002 GW Elevation (NGVD)
MW-1	87.97	79.97	82.17	78.27*	81.77	81.67	81.17	79.97	84.12**
MW-2	85.86	76.86	78.76	75.56*	77.56	77.06	78.16	76.36	82.46**
MW-4	87.16	77.71	79.96	76.56*	78.66	77.86	79.96	77.56	83.06**
MW-5	88.76	77.71	79.76	76.46*	77.96	76.56	79.51	77.46	81.56**
MW-6	87.94	75.59	ND	74.54	75.54	74.64	77.44	74.54*	83.44**
MW-7	87.51	75.86	ND	74.36*	75.51	74.41	75.91	74.91	83.26**
MW-8	88.98	ND	ND	76.18	77.58	75.58*	80.28	76.38	83.18**
MW-9	88.71	ND	ND	75.51	76.91	75.31*	78.71	76.21	83.11**
P-1	91.27	79.92	80.87	80.02	80.47	80.27	81.37**	77.47*	78.57
P-2	90.66	77.56	79.46	76.56	77.61	76.46	79.76**	74.11*	78.46
P-3	89.23	77.45	ND	ND	77.83	77.98	80.75	75.70*	80.70**
P-4	88.34	76.44	77.64	75.39	76.5	Dry	78.74	72.44*	80.39**
P-5	89.25	77.05	77.95	76.65	76.85	Dry	OBSTRUCTED	74.45*	80.55**
P-9	87.06	76.56	78.86	75.71	76.66	75.66	78.56	ND	ND
P-10	88.56	Dry	80.06**	ND	77.46	Dry	79.16	74.06*	76.96
P-11	87.16	76.01	ND	75.86	76.36	76.06	77.76	72.96*	78.06**
P-15	89.21	ND	ND	ND	75.81	74.56	ND	71.26*	78.41**
P-16	88.83	ND	ND	72.65	76.33	Dry	75.55	70.33*	79.69**

Notes:
1. ND = No Data Reported
2. NGVD = National Geodetic Vertical Datum.
3. TOC = top of casing.
4. * = Minimum groundwater level for the reporting period
5. ** = Maximum groundwater level for the reporting period
6. GW= Groundwater

On May 15, 1995 PBS&J conducted slug tests at MW-6, MW-7 and MW-3, located down gradient from the extent of waste. Based on these tests the average hydraulic conductivity of the surficial across the site is 1.4 X 10^{-4} ft/min (0.0230 feet per day). The hydraulic gradient (I) was based on groundwater flow maps generated for the period of record.

The groundwater flow velocity was calculated using the following aquifer values and Darcy's Law ($V=KI/\eta$),

V= groundwater velocity in feet per day
K= hydraulic conductivity of the surficial aquifer (0.0230-5.00 utilized for calculation)
I = gradient of the surficial aquifer (0.003-0.01 utilized for calculation)
η= effective porosity of the surficial aquifer (0.2 utilize or calculation)

Based on the aquifer characteristics discussed above, the groundwater flow velocity in the surficial aquifer ranges from 0.131 to 91 ft/year. The maximum flow velocity was utilized in evaluating the adequacy of the Hardee County groundwater monitoring plan however it should be noted that 91 feet per year is a liberal estimate of the groundwater flow velocity onsite and is not representative of the groundwater velocity at all locations across the site.

SECTION 5

ADEQUACY OF THE WATER QUALITY MONITORING LOCATIONS AND SAMPLING FREQUENCY

Currently, the groundwater-monitoring plan includes six monitoring wells, five designated as detection wells and one designated as a background well, MW-4. In addition, it includes ten piezometers and two groundwater wells which are monitored for specific conductance and water levels only. Each monitoring well and piezometer is designed to monitor the surficial aquifer. Table 5-1 lists the monitoring wells with their current permit designation. The table also includes their approximate distance from waste and their location relative to waste along the hydraulic gradient. Distances were determined in AutoCAD based on the site location map utilizing the latitude and longitude of each well.

TABLE 5-1. WELL LOCATIONS

Well Number	Permit Designation	Approx. Distance from Waste (ft)	Hydraulic Direction
MW-1	Detection	52	Up gradient
MW-2	Detection	62	Cross gradient
MW-4	Background	862	Up gradient
MW-5	Detection	65	Cross gradient
MW-8	Detection	45	Down gradient
MW-9	Detection	70	Down gradient

The current permit indicates that MW-1, MW-2, MW-5, MW-8, and MW-9 are detection wells. Detection wells are to be located down gradient from, and within 50 feet of, disposal units, unless site-specific conditions make such placement impossible. Due to the presence of perimeter ditches on the north and west side of the landfill, monitoring wells MW-1 and MW-5 were placed greater than 50 feet from the edge of waste. At the time of installation of MW-8 and MW-9 a leachate containment ditch was located on the southern edge of the landfill. MW-8 and MW-9 were placed down gradient of the leachate containment ditch. Also a heavily traveled road is located on the east side of the landfill. MW-2 was placed east of the access road to avoid traffic. It is located approximately 62 feet west of the edge of waste.

According to Chapter 62-791 F.A.C., background wells are required to be hydraulically up gradient from waste. MW-1 and MW-4 serve this purpose in the monitoring plan. However, only MW-4 is designated as a background well.

The up-gradient monitoring well locations are no greater than 1500 feet apart, as required by Ch. 62-701.510 F.A.C. The existing down gradient monitoring wells, however, will require an additional monitoring well in the southeast section of the edge of waste to comply with the Chapter 62-701.510, for down-gradient spacing of no greater than 500 feet apart.

Under the current permit groundwater- monitoring wells MW-6 and MW-7 are measured for specific conductance and water levels semi-annually. These wells are located in the former spray field area. These wells should no longer be used for conductivity monitoring as the spray field is no longer in use and MW-8 and MW-9 adequately monitor the conductance of the groundwater down gradient from the landfill. These wells should be re-designated as piezometers and measured semi-annually for water levels only.

LOCATIONS OF SCREENS

Table 2-2 lists the construction characteristics of the monitoring wells currently located at the Hardee County landfill site along with the historical maximum and minimum groundwater levels at each well. ~~In monitoring wells MW-1, MW-2, MW-4, and MW-5,~~ T~~t~~he maximum water level exceeds the screen interval for all wells. h~~—H~~owever several sampling events were performed when water levels intercepted the screened interval and did not indicate the presence of lighter constituents. Based on the above information, the screened intervals of the on-site wells are appropriately placed to intercept contaminants during sampling.

LEACHATE MONITORING

The compliance monitoring protocol for leachate monitoring specifies leachate sampling at Manhole 1, however, this location is occasionally dry and Manhole 9 is sampled as an alternative. The sample location is hydraulically down gradient from Manhole 1 and provides adequate leachate monitoring.

SURFACE WATER MONITORING

According to Chapter 62-701.510. (4), all surface water bodies that may be affected by contamination releases from the facility are currently included in the monitoring plan, SW-1. However, this site is frequently dry, and an alternative sampling location down stream may serve as a more appropriate sampling point. The alternative location should be located downstream from SW-1 and allow for representative sampling of the surface water body before exiting the landfill property.

MONITORING FREQUENCY

The monitoring locations are sampled and analyzed semi-annually in accordance with the permit. Based on maximium groundwater velocity calculations, groundwater movement ~~between the~~ semi-annual sampling events is 46.63~~0.50 14~~ feet-. This rate provides adequate ~~sufficient~~ time to evaluate groundwater contamination at the edge of the zone of discharge if contamination is observed at the detection wells.

PARAMETER LISTS

After reviewing the laboratory parameters detected in the leachate, it appears the required analytical parameters for groundwater and leachate may need to be altered. ~~Currently the parameters listed in 40 CFR Part 258, Appendix I are required for both Leachate and groundwater. However, all parameters detected in the leachate samples are volatile organics and would be detected in EPA 8260 analysis. Therefore the required 40 CFR Part 258, Appendix I parameters for groundwater should be replaced with EPA 8260~~. Currently, key indicator parameters for leachate are not included in the required parameters for groundwater or leachate. Sulfate, biological oxygen demand (BOD), chemical oxygen demand (COD), and Magnesium are typical parameters detected in leachate. Therefore, these parameters should be added to both the groundwater and leachate semi-annual sampling requirements.

SECTION 6

PROPOSED MODIFICATIONS/RECOMMENDATIONS TO THE MONITORING PROGRAM

The current monitoring program does not appear to be adequate to meet the requirements of Chapter 62-710, F.A.C. The following modifications to the plan are recommended.

LABORATORY QUALITY CONTROL AND REPORTING PROCEDURES

After reviewing the semi-annual groundwater analytical reports for the Hardee County Landfill the following recommendations are outlined below:

- Assure that sampling procedures are conducted in accordance with the FDEP's Standard Operating Procedure (SOP) FS 2200 (Ground Water Sampling)
- SOP FS 2200 Field turbidity should be <20 NTU's or less and dissolved oxygen should be <20% saturation during well purging. The use of quiescent sampling techniques will aid in achieving this criterion.
- The laboratory performing the analysis should provide Hardee County with a Quality Assurance Statement in the front of the semi-annual analytical report summarizing the quality assurance objectives and findings.
- The laboratory should achieve lower method detection limits for vanadium, 1,2-dibromoethane (EDB) and 1,2-dibromo-3-chloropropane (DBCP) to meet applicable groundwater standards.
- The quality control samples, field blanks and duplicates, should be analyzed for the identical parameters analyzed in the monitoring well samples.

GROUNDWATER PARAMETERS

Analytical parameters for groundwater should include the following:

Parameters required in current permit	Revised groundwater parameters
Specific Conductivity	Specific Conductivity
pH	pH
Dissolved Oxygen	Dissolved Oxygen
Turbidity	Turbidity
Temperature	Temperature
Total Ammonia -N	Total Ammonia -N

Chlorides	Chlorides
Mercury	Mercury
Nitrate	Nitrate
Iron	Iron
Sodium	Sodium
Total Dissolved Solids (TDS)	Total Dissolved Solids (TDS)
40 CFR part 258 Appendix I	40 CFR Part 258 Appendix I
Color and Sheen (observation)	Color and Sheen (observation)
	Sulfate~~EPA 8260~~
	Magnesium~~Sulfate~~
	BOD~~Magnesium~~
	COD~~BOD~~
	~~COD~~

LEACHATE PARAMETERS

Analytical parameters for leachate should include the following:

Parameters required in current permit	Revised leachate parameters
Specific Conductivity	Specific Conductivity
pH	pH
Dissolved Oxygen	Dissolved Oxygen
Bicarbonate	Bicarbonate
Total Ammonia -N	Total Ammonia -N
Chlorides	Chlorides
Mercury	Mercury
Nitrate	Nitrate
Iron	Iron
Sodium	Sodium
40 CFR part 258 Appendix I	40 CFR part 258 Appendix I
40 CFR part 258 Appendix II (annually)	40 CFR part 258 Appendix II (annually)
Color and Sheen (observation)	Color and Sheen (observation)
	Total Dissolved Solids (TDS)
	Sulfate
	Hardness

SURFACE WATER PARAMETERS

Analytical parameters for surface water should include those parameters listed in Rule 62-701.510 (8)(b) F.A.C.

PROPOSED LEACHATE MONITORING LOCATION

Manhole 9 should replace Manhole 1 as the leachate sampling location. Manhole 9 is located down gradient from Manhole 1 and will allow for representative characterization of the leachate composition. The location of Manhole 9 is shown on Figure 6-1.
In addition, hardness should be added to the list of leachate laboratory parameters, as it will allow the leachate results to be compared with surface water standards. Hardness is required to calculate surface water standards for various metals.

PROPOSED SURFACE WATER MONITORING LOCATION

The current sampling location, SW-1, should be replaced with an alternative location, SW-2. SW-2 should be located in the creek, southwest of SW-1. This location will allow for monitoring of the surface water quality at the landfill property boundary. The proposed surface water location will be sampled for those parameters listed in Rule 62-701.510(8)(b), F.A.C. Surface water sampling will be conducted at SW-2 unless no surface water is present for the entire semi-annual period. The Hardee County Solid Waste Operation Manager will prepare a daily log (excluding Sundays) documenting the presence or absence of water in the creek. If water is observed the Landfill Manger will be notified and will coordinate with the laboratory contractor to collect a surface water sample. Per Rule 62-710.510 F.A.C., the surface water monitoring location will~~should~~ be marked and the position determined by a registered Florida Land Surveyor. The proposed location of SW-2 is shown on Figure 6-1.

PROPOSED MONITORING WELLS

An additional detection well, MW-10, should be added to the monitoring plan. It will be located less than 500 feet south east of MW-9, in order to comply with Chapter 62-710,510 F.A.C., well spacing should be no greater than 500 feet apart. This well will also serve as a replacement water level data point for the destroyed piezometer P-6. Figure 6-2 lists the proposed well location. Table 6-1 lists the approximate construction characteristics. The total depth and screened interval are based on the specifications and groundwater level fluctuation measured in MW-9.

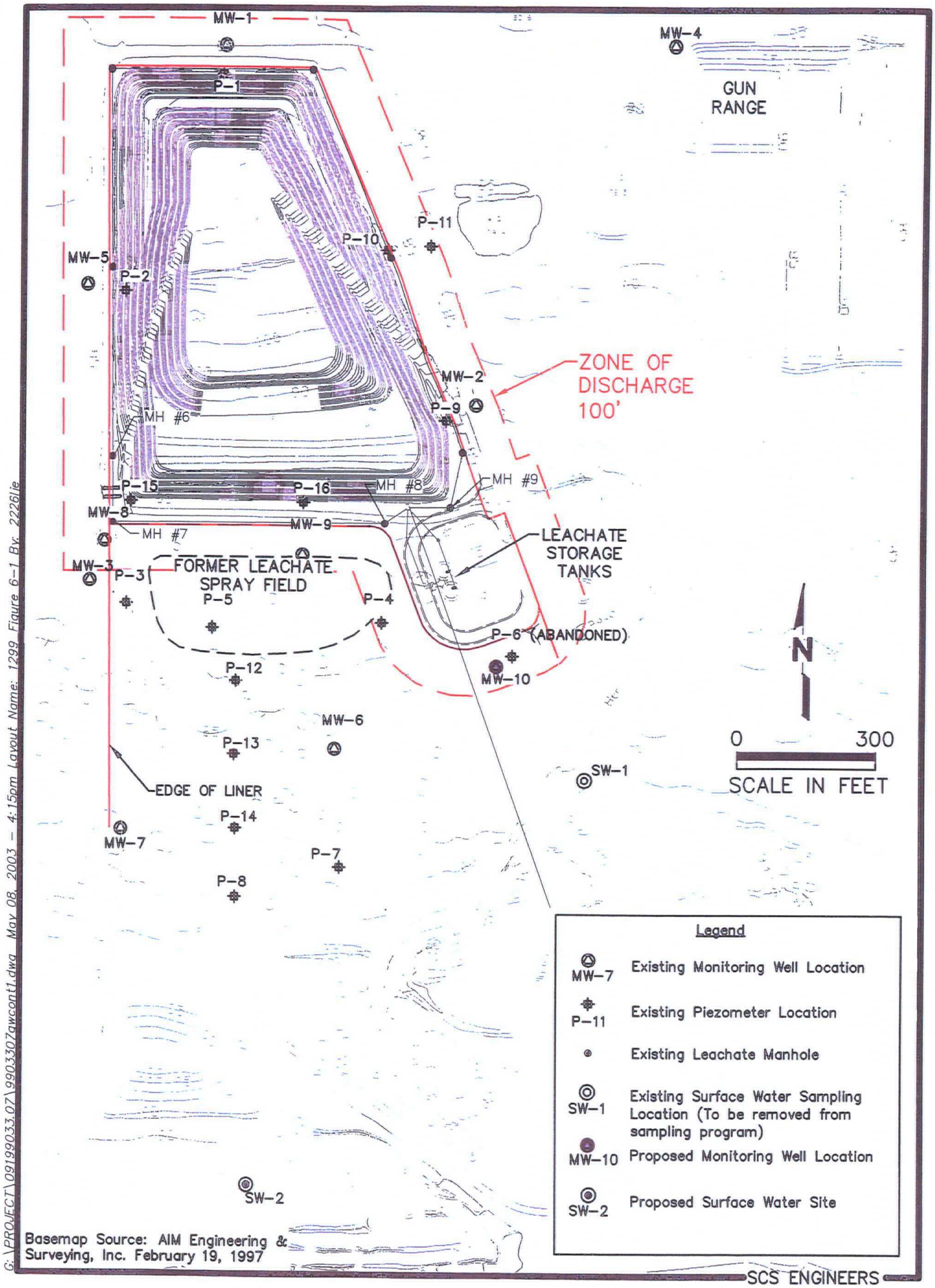


Figure 6–1. Site Map of Proposed Well Locations for Revised Monitoring Plan
Hardee County Solid Waste Disposal Facility

TABLE 6-1. PROPOSED MONITORING WELL MW-10 CONSTRUCTION SPECIFICATIONS

Well Number	Well Diameter	Total Depth bls (ft)	Casing length (ft)	Screen length (ft)	Screened Intervals bls (ft)
MW-10	2'	17.00	2	15.00	2-17

<u>Revised Groundwater Monitoring Plan Well Designations</u>

According to Chapter 62-701 F.A.C., background wells are required to be hydraulically up gradient and MW-1 and MW-4 appear to serve this purpose in the monitoring plan. The well designation for MW-1 should be changed to a background well.

It is recommend that the designation of the monitoring wells be revised as listed in Table 6-2 to meet the requirements of Chapter 62-710, F.A.C.

TABLE 6-2. REVISED DESIGNATION OF MONITORING WELLS

Well Number	Permit Designation	Approx. Distance from Waste (ft)	Hydraulic Direction
MW-1	Background	52.00	Up gradient
MW-2	Detection	62.05	Cross gradient
MW-4	Background	861.66	Up gradient
MW-5	Detection	64.96	Cross gradient
MW-8	Detection	44.55	Down gradient
MW-9	Detection	70.17	Down gradient
MW-10*	Detection	50.00	Down gradient

* Proposed Groundwater Monitoring Well

Monitoring wells MW-6 and MW-7 should be designated as piezometers and monitored semi-annually for water levels only.

ATTACHMENT A

GROUNDWATER QUALITY DATA CHARTS

HARDEE COUNTY LANDFILL

MW-1 DATA SUMMARY Detection Well										
PARAMETER	MCL	UNITS	DATE OF SAMPLE COLLECTION							
			Jun-99	Dec-99	Jun-00	Dec-00	Jun-01	Dec-01	Jun-02	Dec-02
Inorganic Parameters:										
Arsenic[1]	50	µg/L	<5.0	6	<5.0	<5.0	<5.0	13	<5.0	7
Barium[1]	2,000	µg/L	<20	<20	<20	20	<20	50	30	20
Cadmium[1]	5	µg/L	<2	<2	<2	<2	<2	<2	<2	<2
Chromium[1]	100	µg/L	5	<5.0	13	7	<5.0	11	<5.0	<5.0
Copper[2]	1,000	µg/L	10	<10	<10	<10	<10	10	<10	<10
Iron[2]	300	µg/L	**7,930**	**8,820**	**8,610**	**10,200**	**7,510**	**13,900**	**5,370**	**8,710**
Lead[1]	15	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	5	2	<1.0
Nickel[1]	100	µg/L	<10	<10	<10	<10	<10	<10	20	<30
Sodium[1]	160,000	µg/L	13,000	14,000	13,000	20,000	17,000	17,000	17,000	12,000
Vanadium[1]	49	µg/L	<100	<100	<100	<100	<100	<100	<100	<100
Zinc[2]	5,000	µg/L	4	7	9	10	6	9	11	2
Total Dissolved Solids[2]	500	mg/L	178	230	180	354	286	248	212	241
Chloride[2]	250	mg/L	32	32	35	56	41	38	39	41
Nitrate, Nitrogen[1]	10	mg/L	0.04	0.04	0.19	0.05	0.08	1.35	0.07	<0.02
Nitrite, Nitrogen[1]	1	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Nitrate + Nitrite Nitrogen (NO2 + NO3)[1]	10	mg/L	0.04	0.04	0.19	0.05	0.08	1.35	0.08	<0.02
Nitrogen Ammonia (As N)[3]	2.8	mg/L	0.15	0.07	0.22	0.14	0.09	0.08	0.04	0.26
Field Parameters:										
Specific Conductance (Field)	NS	umho/cm	214	236	215	356	268	241	225	240
pH (Field)[2]	6.5-8.5	Unit	**5.07**	**4.84**	**4.95**	**4.83**	**4.82**	**4.76**	**5.05**	**4.77**
Temperature (Field)	NS	Deg C	25.1	24.2	27.4	23.6	24.8	26.1	26.8	21.6
Turbidity (Field)	NS	NTU	16.3	19.8	19.1	14.2	8.83	127	1.40	2.86
Dissolved Oxygen (Field)	NS	mg/L	3	5	6.2	2.2	4.2	5.4	7.2	1.8
Organic Parameters:										
Total Xylenes[1]	10,000	µg/L	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<1.00

Notes:

MCL = Maximum Contaminant Level.

NS = No Standard Set

--- = Not Tested.

Shaded = Sample result above the MCL.

[1] Parameter MCL is a Primary Drinking Water Standard (62-550 F.A.C.).

[2] Parameter MCL is a Secondary Drinking Water Standard (62-550 F.A.C.).

[3] Parameter MCL is a Groundwater Clean-up Target Level (62-777 F.A.C.).

HARDEE COUNTY LANDFILL

MW-2 DATA SUMMARY Detection Well										
PARAMETER	MCL	UNITS	DATE OF SAMPLE COLLECTION							
			Jun-99	Dec-99	Jun-00	Dec-00	Jun-01	Dec-01	Jun-02	Dec-02
Inorganic Parameters:										
Arsenic[1]	50	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Barium[1]	2,000	µg/L	<20	<20	<20	<20	<20	30	40	50
Cadmium[1]	5	µg/L	<2	<2	<2	<2	<2	<2	<2	4
Chromium[1]	100	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Copper[2]	1,000	µg/L	10	<10	<10	<10	<10	<10	20	<10
Iron[2]	300	µg/L	**2,410**	**8,920**	**7,920**	**8,480**	**5,980**	**8,140**	**14,200**	**3,240**
Lead[1]	15	µg/L	<1.0	<1.0	<1.0	<1.0	1	3	5	<1
Nickel[1]	100	µg/L	20	<10	<10	<10	<10	<10	<10	20
Sodium[1]	160,000	µg/L	8,700	8,900	6,700	7,200	6,900	8,800	14,000	24,000
Vanadium[1]	49	µg/L	<100	<100	<100	<100	<100	<100	<100	<100
Zinc[2]	5,000	µg/L	3	2	4	3	<2.0	7	28	<2
Total Dissolved Solids[2]	500	mg/L	148	182	193	194	174	178	236	350
Chloride[2]	250	mg/L	7	10	11	8.5	6.7	12	30	35
Nitrate, Nitrogen[1]	10	mg/L	0.03	0.06	0.07	0.03	0.11	0.06	0.07	<0.02
Nitrite, Nitrogen[1]	1	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Nitrate + Nitrite Nitrogen (NO2 + NO3)[1]	10	mg/L	0.03	0.06	0.07	0.03	0.11	0.06	0.08	<0.02
Nitrogen Ammonia (As N)[3]	2.8	mg/L	0.15	0.10	0.19	0.14	0.06	0.14	0.18	<0.04
Field Parameters:										
Specific Conductance (Field)	NS	umho/cm	320	359	382	320	263	306	392	535
pH (Field)[2]	6.5-8.5	Unit	6.60	6.76	6.83	6.64	**6.34**	**6.47**	**6.44**	6.62
Temperature (Field)	NS	Deg C	25.9	25.1	26.1	23.7	25.1	25.7	27.5	20.4
Turbidity (Field)	NS	NTU	25.8	15.6	28.5	16.4	21.6	6.33	17.30	25.10
Dissolved Oxygen (Field)	NS	mg/L	5.8	4.6	1.4	4.6	2.1	3.2	4.6	1.7
Organic Parameters:										
Total Xylenes[1]	10,000	µg/L	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<1.0

Notes:

MCL = Maximum Contaminant Level.

NS = No Standard Set

--- = Not Tested.

Shaded = Sample result above the MCL.

[1] Parameter MCL is a Primary Drinking Water Standard (62-550 F.A.C.).

[2] Parameter MCL is a Secondary Drinking Water Standard (62-550 F.A.C.).

[3] Parameter MCL is a Groundwater Clean-up Target Level (62-777 F.A.C.).

HARDEE COUNTY LANDFILL

MW-4 DATA SUMMARY Background Well										
PARAMETER	MCL	UNITS	DATE OF SAMPLE COLLECTION							
			Jun-99	Dec-99	Jun-00	Dec-00	Jun-01	Dec-01	Jun-02	Dec-02
Inorganic Parameters:										
Arsenic[1]	50	µg/L	8	8	8	<5.0	<5.0	14	10	14
Barium[1]	2,000	µg/L	<20	<20	<20	<20	40	30	40	40
Cadmium[1]	5	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	4
Chromium[1]	100	µg/L	<5.0	6	<5.0	7	9	5	5	5
Copper[2]	1,000	µg/L	20	<10	<10	<10	<10	<10	<10	<10
Iron[2]	300	µg/L	**9,110**	**8,590**	**12,500**	**3,210**	**5,150**	**10,900**	**7,260**	**8,950**
Lead[1]	15	µg/L	<1.0	1.0	<1.0	1	6	<1.0	<1.0	<1.0
Nickel[1]	100	µg/L	<10	<10	<10	<10	<10	<10	10	20
Sodium[1]	160,000	µg/L	4,600	4,600	6,600	3,800	6,100	6,700	5,800	3,000
Vanadium[1]	49	µg/L	<100	<100	<100	<100	<100	<100	<100	<100
Zinc[2]	5,000	µg/L	8	<2.0	<2.0	<2.0	4	<2.0	<2.0	<2.0
Total Dissolved Solids[2]	500	mg/L	128	144	140	164	192	288	172	312
Chloride[2]	250	mg/L	8.5	7.3	44	5.5	14	9	10	6.7
Nitrate, Nitrogen[1]	10	mg/L	0.02	<0.02	0.02	0.06	0.29	<0.02	0.75	<0.02
Nitrite, Nitrogen[1]	1	mg/L	<0.01	<0.01	0.02	<0.01	0.03	0.02	0.02	<0.01
Nitrate + Nitrite Nitrogen (NO2 + NO3)[1]	10	mg/L	0.02	<0.02	0.04	0.06	0.32	0.03	0.77	<0.02
Nitrogen Ammonia (As N)[3]	2.8	mg/L	0.14	<0.04	0.21	<0.04	<0.04	0.22	0.16	0.16
Field Parameters:										
Specific Conductance (Field)	NS	umho/cm	182	116	195	123	138	299	189	363
pH (Field)[2]	6.5-8.5	Unit	**6.26**	**6.20**	**5.83**	**5.98**	**5.63**	**6.27**	**6.12**	6.58
Temperature (Field)	NS	Deg C	22.8	23.4	23	23	24.3	23.3	24.7	21.8
Turbidity (Field)	NS	NTU	10.8	41	8.72	60.2	82.4	8.24	0.92	0.95
Dissolved Oxygen (Field)	NS	mg/L	2.8	4.8	1	1.8	2.4	2.8	3.5	1.5
Organic Parameters:										
Total Xylenes[1]	10,000	µg/L	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<1.00

Notes:

MCL = Maximum Contaminant Level.

NS = No Standard Set

--- = Not Tested.

Shaded = Sample result above the MCL.

[1] Parameter MCL is a Primary Drinking Water Standard (62-550 F.A.C.).

[2] Parameter MCL is a Secondary Drinking Water Standard (62-550 F.A.C.).

[3] Parameter MCL is a Groundwater Clean-up Target Level (62-777 F.A.C.).

HARDEE COUNTY LANDFILL

MW-5 DATA SUMMARY Detection Well										
PARAMETER	MCL	UNITS	DATE OF SAMPLE COLLECTION							
			Jun-99	Dec-99	Jun-00	Dec-00	Jun-01	Dec-01	Jun-02	Dec-02
Inorganic Parameters:										
Arsenic[1]	50	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Barium[1]	2,000	µg/L	<20	<20	<20	<20	<20	<20	<20	<20
Cadmium[1]	5	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2
Chromium[1]	100	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Copper[2]	1,000	µg/L	<10	<10	<10	<10	<10	<10	<10	<10
Iron[2]	300	µg/L	**4,430**	**3,560**	**2,930**	**3,090**	**3,330**	**4,030**	**3,880**	**2,950**
Lead[1]	15	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nickel[1]	100	µg/L	<10	<10	<10	<10	<10	<10	<10	10
Sodium[1]	160,000	µg/L	4,500	4,400	3,300	4,300	3,900	3,600	3,100	5,100
Vanadium[1]	49	µg/L	<100	<100	<100	<100	<100	<100	<100	<100
Zinc[2]	5,000	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	6
Total Dissolved Solids[2]	500	mg/L	44	60	46	74	74	56	56	54
Chloride[2]	250	mg/L	12	5.6	6.6	6.5	5.4	5.1	5.1	3.9
Nitrate, Nitrogen[1]	10	mg/L	<0.02	<0.02	0.03	<0.02	0.03	<0.02	<0.02	0.02
Nitrite, Nitrogen[1]	1	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02
Nitrate + Nitrite Nitrogen (NO2 + NO3)[1]	10	mg/L	<0.02	<0.02	0.03	<0.02	0.03	<0.02	<0.02	0.04
Nitrogen Ammonia (As N)[3]	2.8	mg/L	0.16	0.08	0.16	0.07	0.10	0.15	0.16	0.11
Field Parameters:										
Specific Conductance (Field)	NS	umho/cm	75	72	100	83	88	71	75	62
pH (Field)[2]	6.5-8.5	Unit	**5.18**	**5.32**	**5.29**	**5.25**	**5.08**	**5.07**	**5.31**	**5.17**
Temperature (Field)	NS	Deg C	24.9	25.1	25.2	24.7	26.6	25.9	26.4	23.3
Turbidity (Field)	NS	NTU	2.7	1.71	10	5.28	16.8	16.30	0.93	14.90
Dissolved Oxygen (Field)	NS	mg/L	2.4	3.6	1.1	0.9	1.8	2.6	2.5	2.6
Organic Parameters:										
Total Xylenes[1]	10,000	µg/L	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<1.00

Notes:

MCL = Maximum Contaminant Level.

NS = No Standard Set

--- = Not Tested.

Shaded = Sample result above the MCL.

[1] Parameter MCL is a Primary Drinking Water Standard (62-550 F.A.C.).

[2] Parameter MCL is a Secondary Drinking Water Standard (62-550 F.A.C.).

[3] Parameter MCL is a Groundwater Clean-up Target Level (62-777 F.A.C.).

HARDEE COUNTY LANDFILL

MW-8 DATA SUMMARY Detection Well										
PARAMETER	MCL	UNITS	DATE OF SAMPLE COLLECTION							
			Jun-99	Dec-99	Jun-00	Dec-00	Jun-01	Dec-01	Jun-02	Dec-02
Inorganic Parameters:										
Arsenic[1]	50	µg/L	---	---	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Barium[1]	2,000	µg/L	---	---	<20	<20	40	110	30	40
Cadmium[1]	5	µg/L	---	---	<2.0	<2.0	<2.0	<2.0	<2.0	3
Chromium[1]	100	µg/L	---	---	<5.0	<5.0	17	36	<5.0	<5.0
Copper[2]	1,000	µg/L	---	---	<10	<10	<10	<10	<10	<10
Iron[2]	300	µg/L	---	---	**3,310**	**2,670**	**7,770**	**14,300**	**820**	300
Lead[1]	15	µg/L	---	---	<1.0	1	8	4.0*	2	<1.0
Nickel[1]	100	µg/L	---	---	<10	<10	<10	<10	<10	<10
Sodium[1]	160,000	µg/L	---	---	6,300	7,600	7,200	9,900	6,900	8,700
Vanadium[1]	49	µg/L	---	---	<100	<100	<100	<100	<100	<100
Zinc[2]	5,000	µg/L	---	---	<2.0	3	12	26	9	23
Total Dissolved Solids[2]	500	mg/L	---	---	80	112	102	152	100	79
Chloride[2]	250	mg/L	---	---	18	22	18	16	11	11
Nitrate, Nitrogen[1]	10	mg/L	---	---	0.02	0.06	0.1	0.62	0.02	0.13
Nitrite, Nitrogen[1]	1	mg/L	---	---	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
Nitrate + Nitrite Nitrogen (NO2 + NO3)[1]	10	mg/L	---	---	0.02	0.06	0.1	0.64	0.02	0.13
Nitrogen Ammonia (As N)[3]	2.8	mg/L	---	---	0.07	<0.04	<0.04	0.07	0.05	<0.04
Field Parameters:										
Specific Conductance (Field)	NS	umho/cm	---	---	172	168	171	135	128	184
pH (Field)[2]	6.5-8.5	Unit	---	---	**5.46**	**5.51**	**5.84**	**5.58**	**5.69**	**5.79**
Temperature (Field)	NS	Deg C	---	---	26.5	253	26.2	26	26.8	21.4
Turbidity (Field)	NS	NTU	---	---	40.2	21.2	58.6	364.00	2.24	21.40
Dissolved Oxygen (Field)	NS	mg/L	---	---	2.1	1.6	1.6	5	2.3	1.1
Organic Parameters:			---	---						
Total Xylenes[1]	10,000	µg/L	---	---	<0.11	<0.11	<0.11	<0.11	<0.11	<1.00

Notes:

MCL = Maximum Contaminant Level.

NS = No Standard Set

--- = Not Tested.

Shaded = Sample result above the MCL.

* = Result is from the March 1, 2002 resampling event. December 2001 sampling result was 23 µg/L.

[1] Parameter MCL is a Primary Drinking Water Standard (62-550 F.A.C.).

[2] Parameter MCL is a Secondary Drinking Water Standard (62-550 F.A.C.).

[3] Parameter MCL is a Groundwater Clean-up Target Level (62-777 F.A.C.).

HARDEE COUNTY LANDFILL

MW-9 DATA SUMMARY Detection Well										
PARAMETER	MCL	UNITS	DATE OF SAMPLE COLLECTION							
			Jun-99	Dec-99	Jun-00	Dec-00	Jun-01	Dec-01	Jun-02	Dec-02
Inorganic Parameters:										
Arsenic[1]	50	µg/L	---	---	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Barium[1]	2,000	µg/L	---	---	100	<20	30	<20	30	<20
Cadmium[1]	5	µg/L	---	---	<2.0	<2.0	<2.0	<2.0	<2.0	3
Chromium[1]	100	µg/L	---	---	6.0	<5.0	<5.0	<5.0	<5.0	<5.0
Copper[2]	1,000	µg/L	---	---	<10	<10	<10	<10	<10	<10
Iron[2]	300	µg/L	---	---	**3,320**	**1,320**	**1,140**	**580**	300	**350**
Lead[1]	15	µg/L	---	---	<1.0	<1.0	3	<1.0	<1.0	<1.0
Nickel[1]	100	µg/L	---	---	<10	<10	<10	<10	<10	10
Sodium[1]	160,000	µg/L	---	---	31,000	36,000	25,000	14,000	6,200	9,800
Vanadium[1]	49	µg/L	---	---	<100	<100	**110**	<100	<100	<100
Zinc[2]	5,000	µg/L	---	---	3	<2.0	3	29	9	12
Total Dissolved Solids[2]	500	mg/L	---	---	130	150	114	64	60	138
Chloride[2]	250	mg/L	---	---	62	74	24	5.2	3.7	10
Nitrate, Nitrogen[1]	10	mg/L	---	---	<0.02	<0.02	<0.02	<0.02	0.51	0.06
Nitrite, Nitrogen[1]	1	mg/L	---	---	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate + Nitrite Nitrogen (NO2 + NO3)[1]	10	mg/L	---	---	<0.02	<0.02	<0.02	<0.02	0.51	0.06
Nitrogen Ammonia (As N)[3]	2.8	mg/L	---	---	0.23	0.07	<0.04	<0.04	0.07	<0.04
Field Parameters:										
Specific Conductance (Field)	NS	umho/cm	---	---	262	300	208	109	63	235
pH (Field)[2]	6.5-8.5	Unit	---	---	**4.82**	**5.06**	**6.76**	**5.46**	**5.21**	**6.13**
Temperature (Field)	NS	Deg C	---	---	26.5	25.2	26.1	25.6	28	22.5
Turbidity (Field)	NS	NTU	---	---	2.84	4.15	19.6	5.74	0.84	8.02
Dissolved Oxygen (Field)	NS	mg/L	---	---	1	0.8	1.5	2.4	1.9	3.9
Organic Parameters:										
Total Xylenes[1]	10,000	µg/L	---	---	0.11	<0.11	<0.11	<0.11	<0.11	<1.00

Notes:

MCL = Maximum Contaminant Level.

NS = No Standard Set

--- = Not Tested.

Shaded = Sample result above the MCL.

[1] Parameter MCL is a Primary Drinking Water Standard (62-550 F.A.C.).

[2] Parameter MCL is a Secondary Drinking Water Standard (62-550 F.A.C.).

[3] Parameter MCL is a Groundwater Clean-up Target Level (62-777 F.A.C.).

MW-6 DATA SUMMARY

PARAMETER	MCL	UNITS	DATE OF SAMPLE COLLECTION							
			Jun-99	Dec-99	Jun-00	Dec-00	Jun-01	Dec-01	Jun-02	Dec-02
Field Parameters:										
Specific Conductance (Field)	NA	umho/cm	180	---	---	---	---	123	101	107

Notes:
MCL = Maximum Contaminant Level.
NS = No Standard Set
--- = Not Tested.
Shaded = Sample result above the MCL.
[1] Parameter MCL is a Primary Drinking Water Standard (62-550 F.A.C.).
[2] Parameter MCL is a Secondary Drinking Water Standard (62-550 F.A.C.).
[3] Parameter MCL is a Groundwater Clean-up Target Level (62-777 F.A.C.).

MW-7 DATA SUMMARY

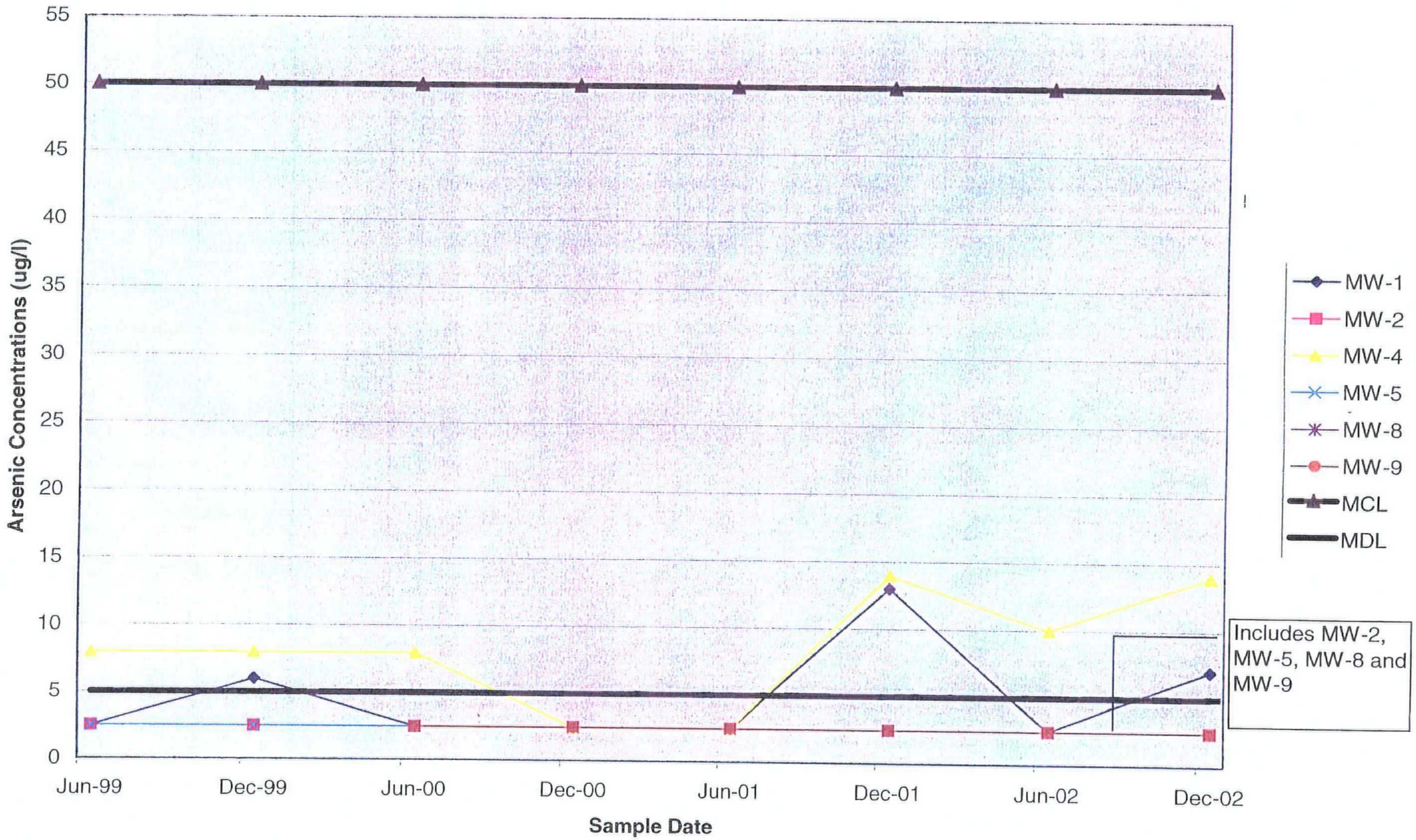
PARAMETER	MCL	UNITS	DATE OF SAMPLE COLLECTION							
			Jun-99	Dec-99	Jun-00	Dec-00	Jun-01	Dec-01	Jun-02	Dec-02
Field Parameters:										
Specific Conductance (Field)	NA	umho/cm	95	---	---	---	---	67	62	59

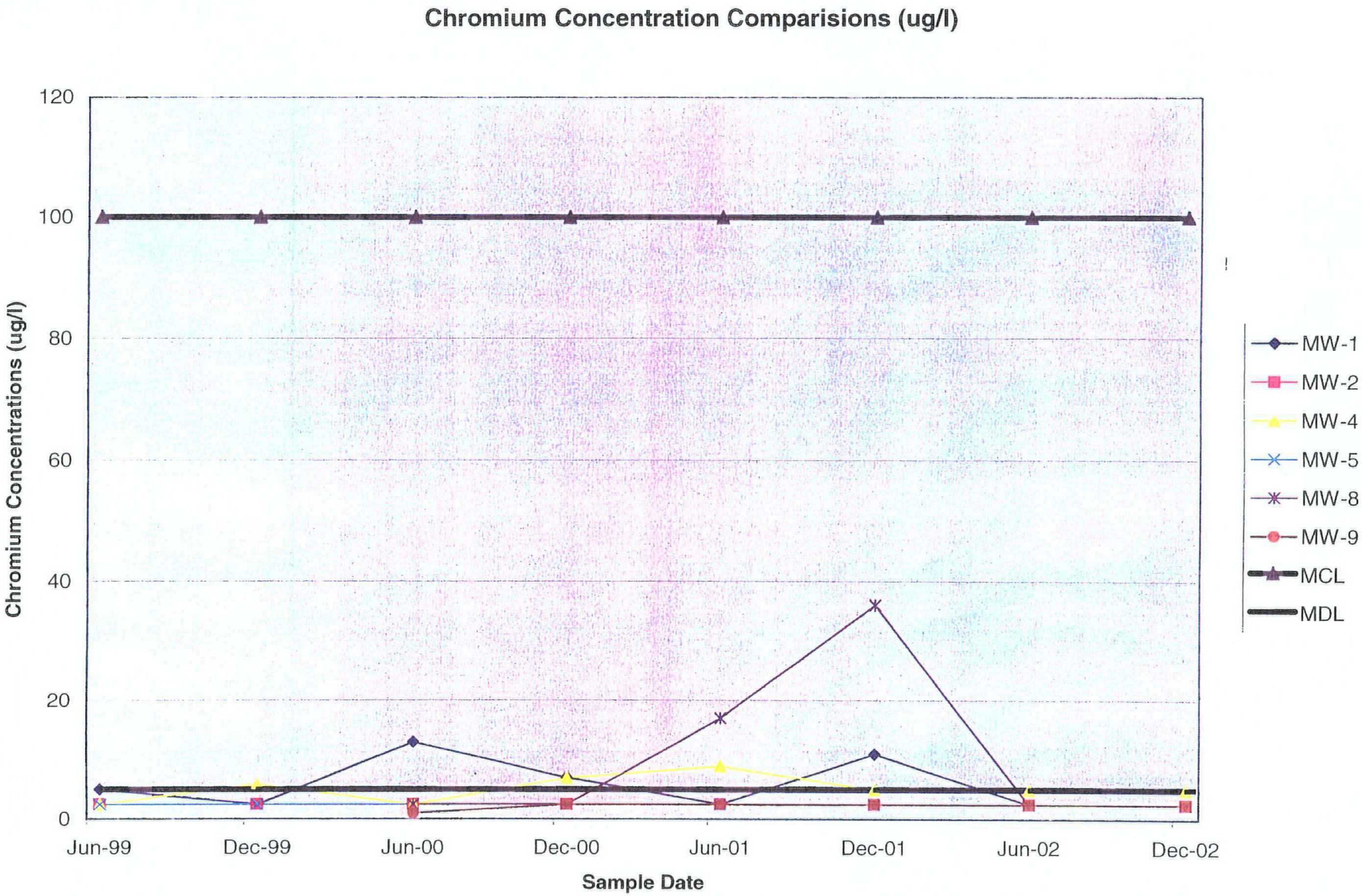
Notes:
MCL = Maximum Contaminant Level.
NS = No Standard Set
--- = Not Tested.
Shaded = Sample result above the MCL.
[1] Parameter MCL is a Primary Drinking Water Standard (62-550 F.A.C.).
[2] Parameter MCL is a Secondary Drinking Water Standard (62-550 F.A.C.).
[3] Parameter MCL is a Groundwater Clean-up Target Level (62-777 F.A.C.).

ATTACHMENT B

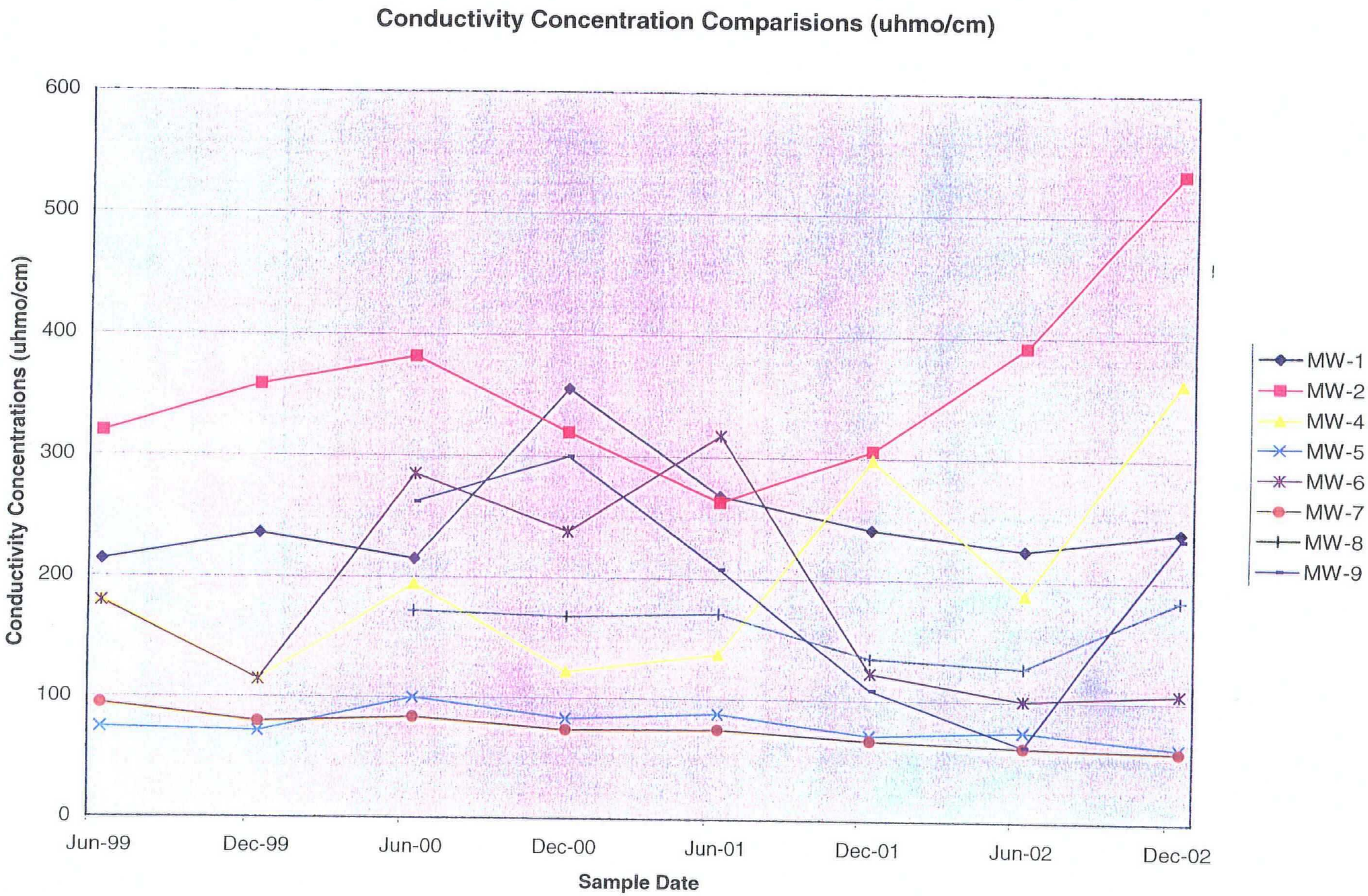
WATER QUALITY TREND ANALYSES

Arsenic Concentration Comparisions (ug/L)

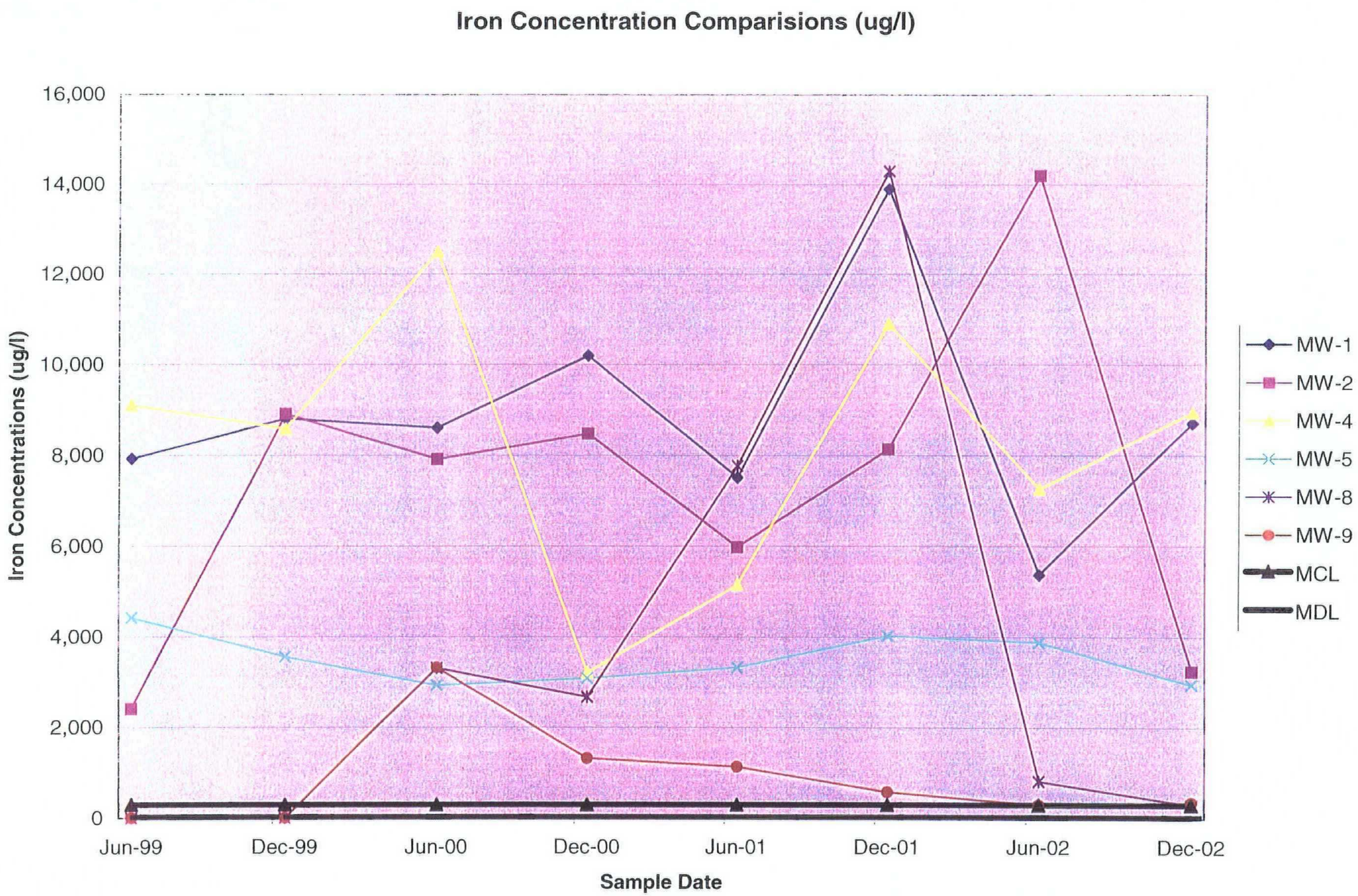




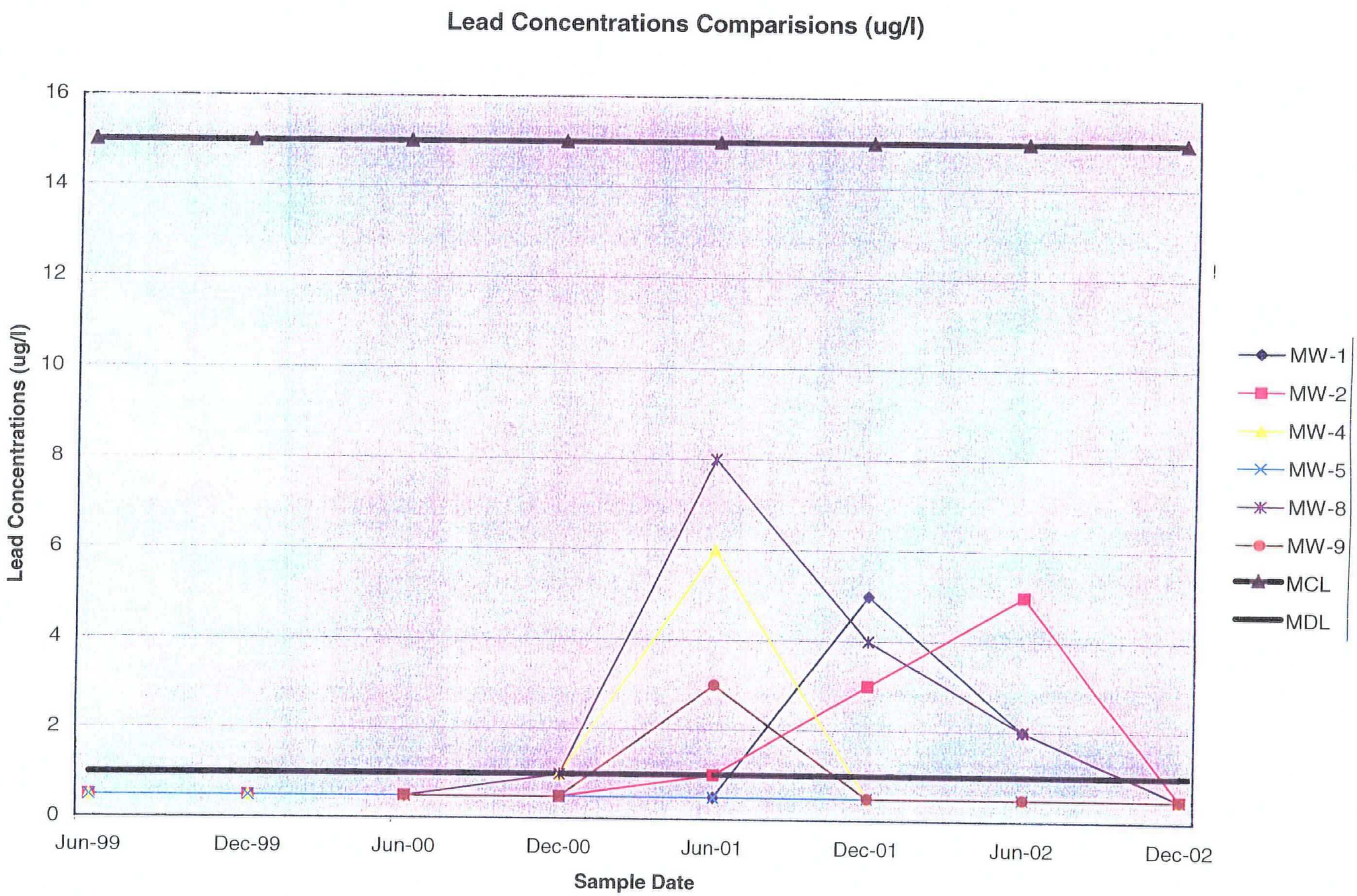
Chromium Concentration Comparisions (ug/l)
Chromium Concentrations (ug/l)
120
100
80
60
40
20
0
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Sample Date
MW-1
MW-2
MW-4
MW-5
MW-8
MW-9
MCL
MDL



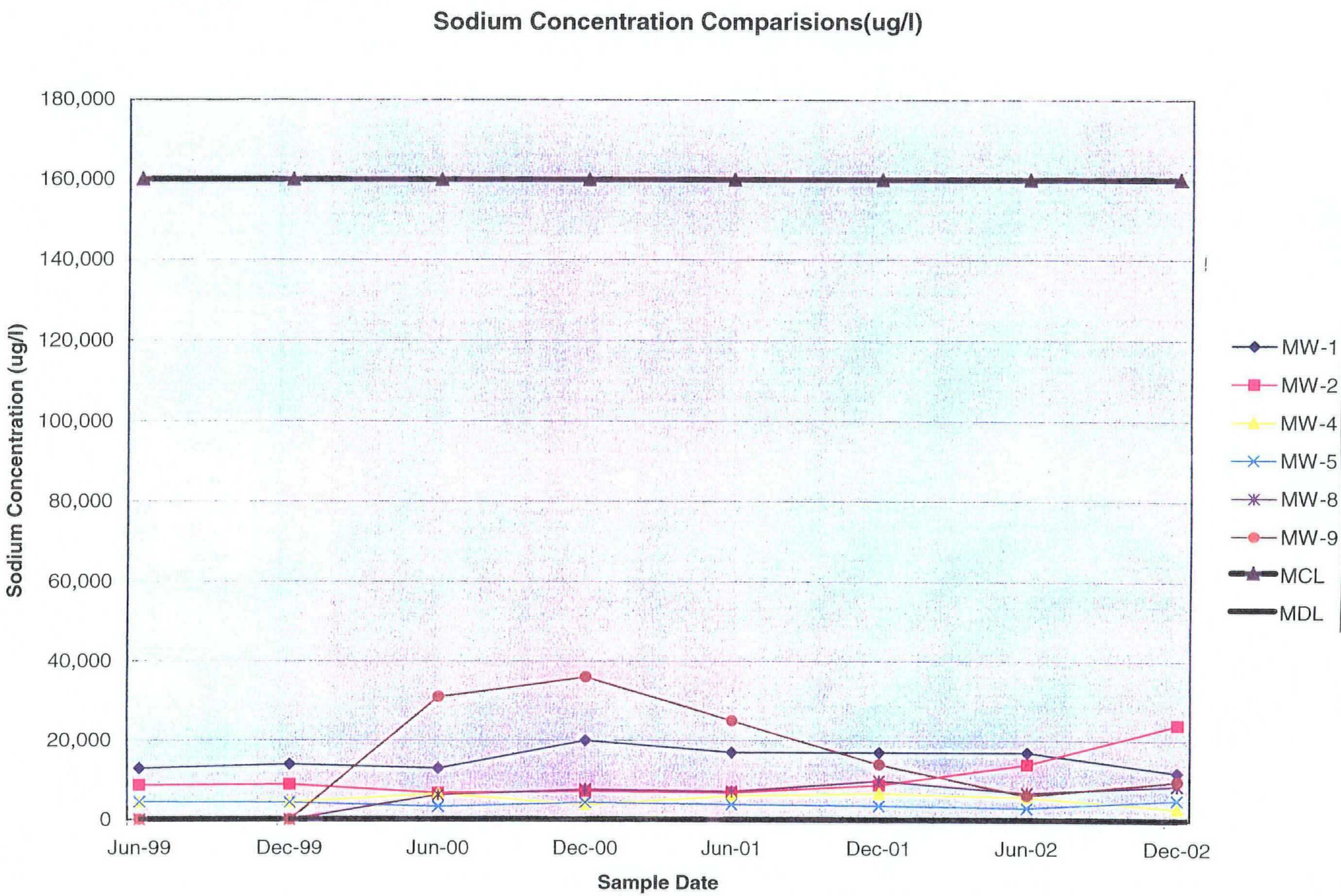
Conductivity Concentration Comparisions (uhmo/cm)
Conductivity Concentrations (uhmo/cm)
600
500
400
300
200
100
0
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Sample Date
MW-1
MW-2
MW-4
MW-5
MW-6
MW-7
MW-8
MW-9

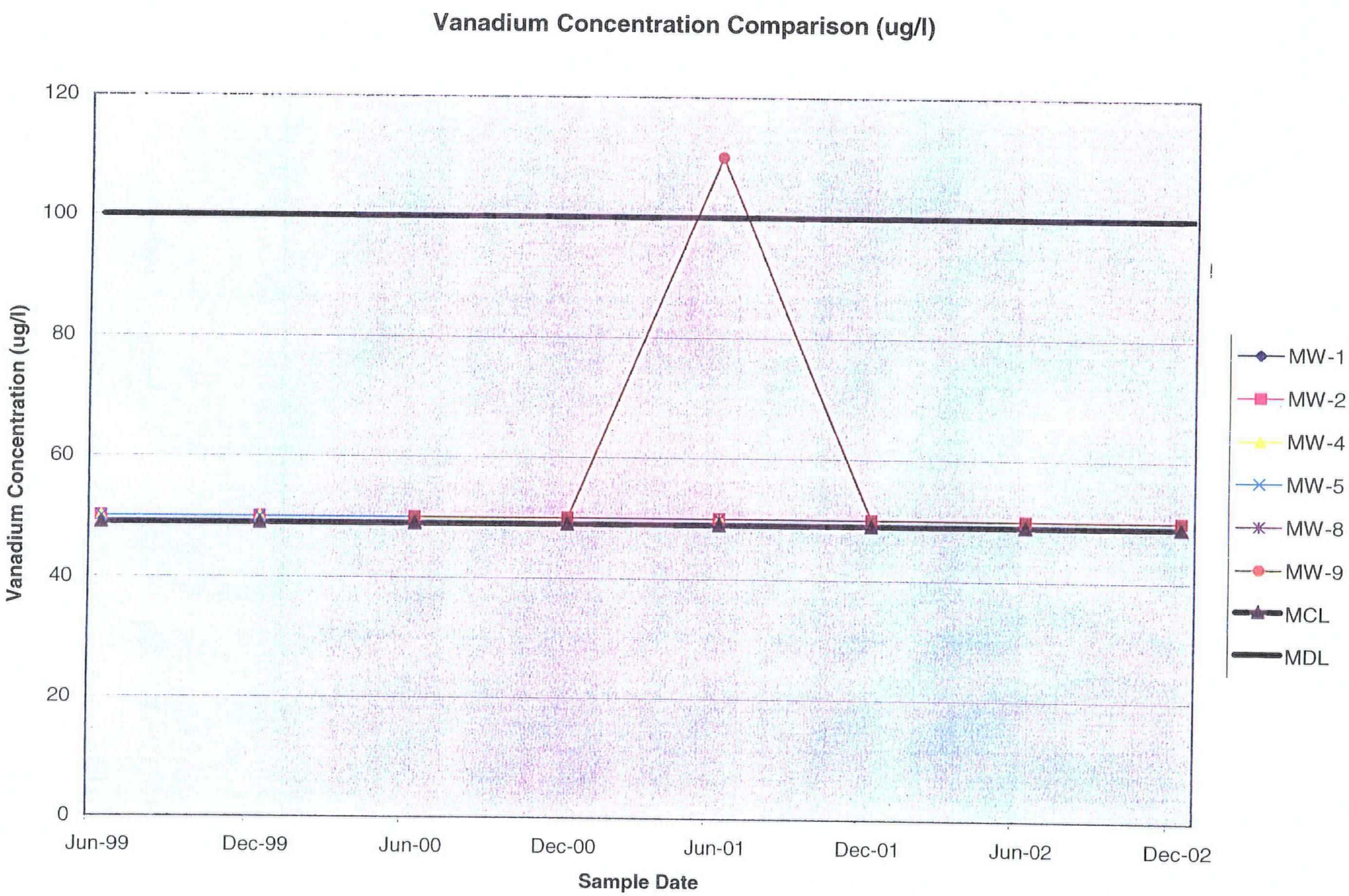


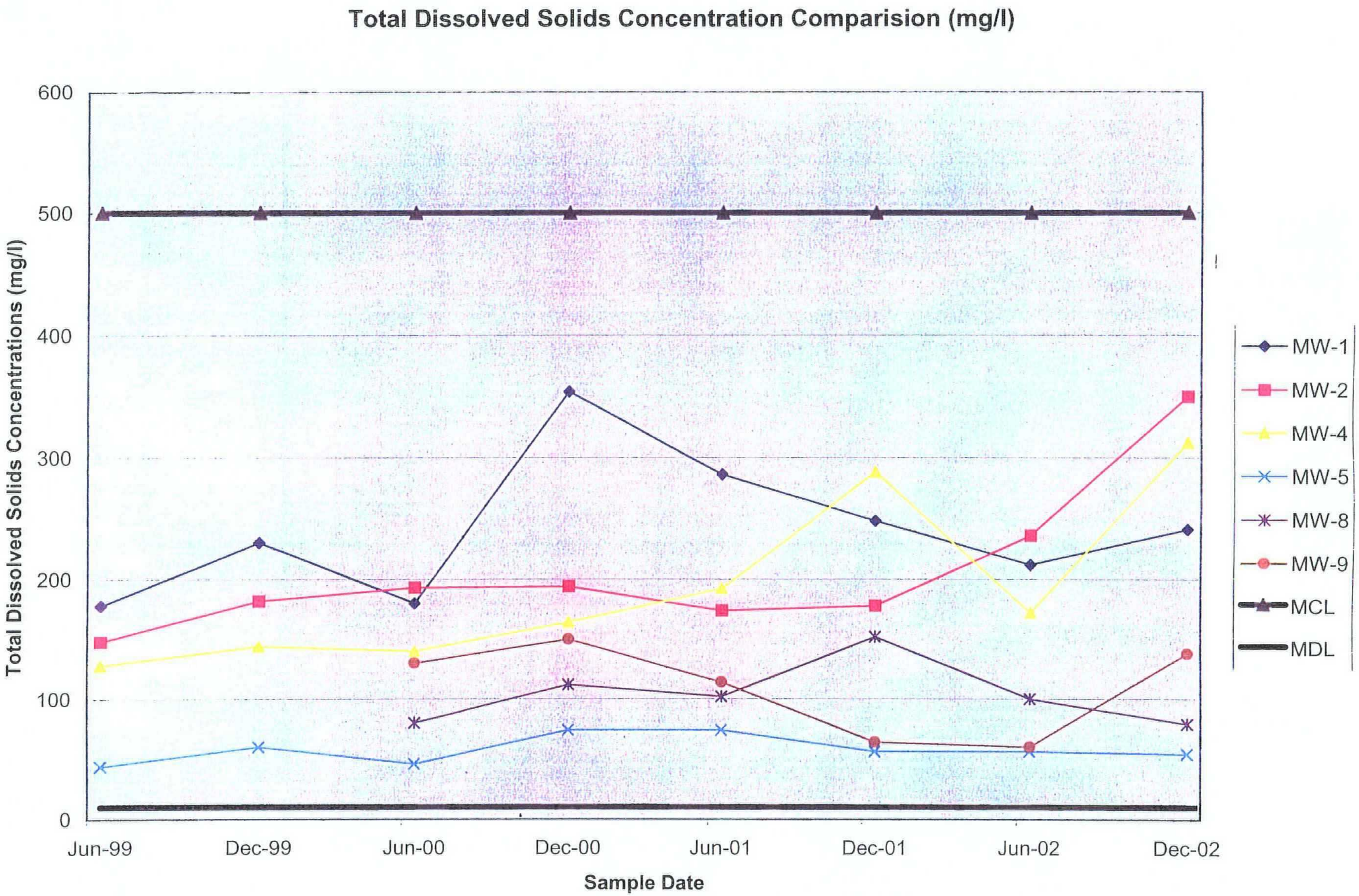
Iron Concentration Comparisions (ug/l)
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Iron Concentrations (ug/l)
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Sample Date
MW-1
MW-2
MW-4
MW-5
MW-8
MW-9
MCL
MDL

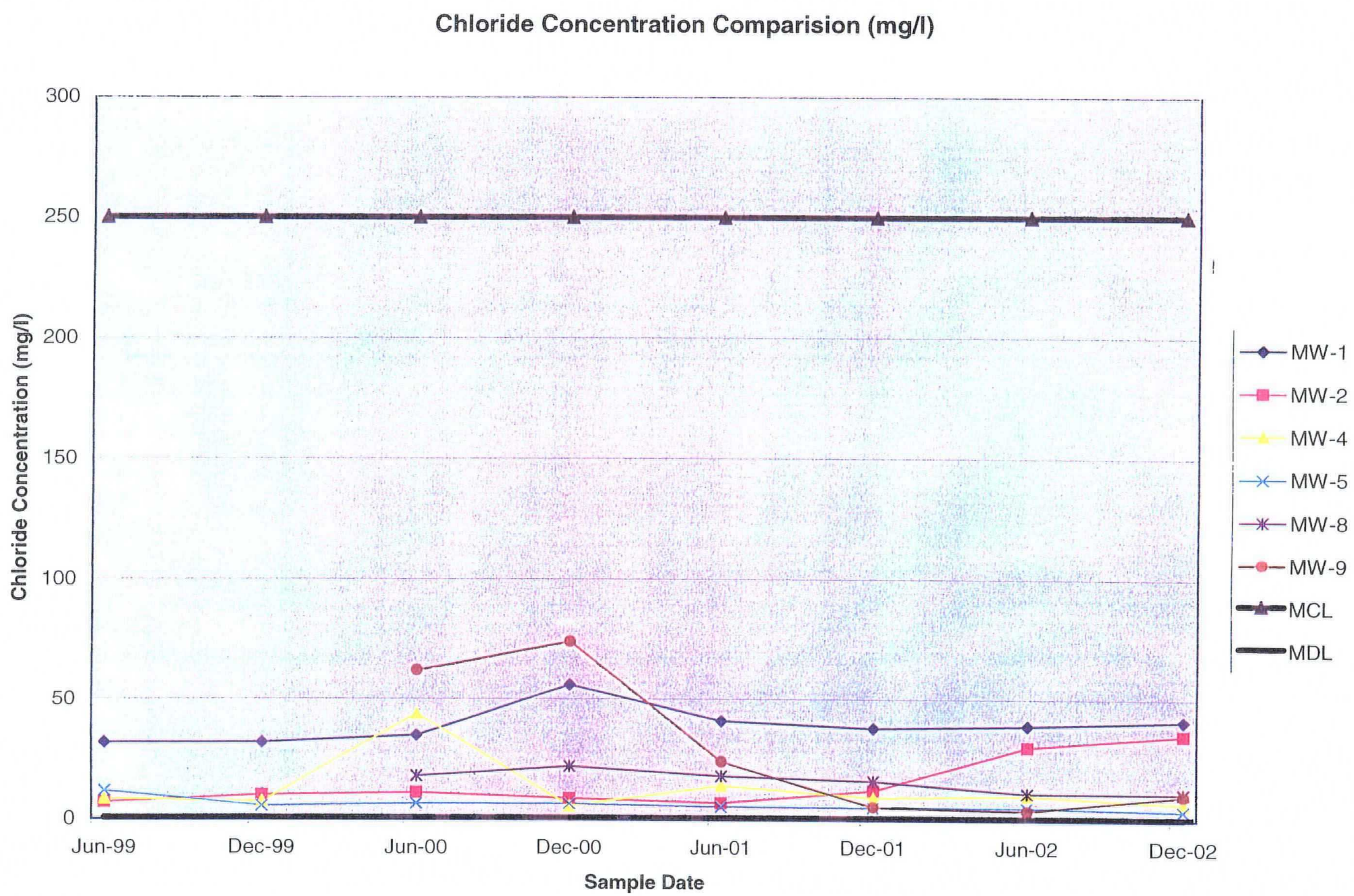


Lead Concentrations Comparisions (ug/l)
16
14
12
10
8
6
4
2
0
Lead Concentrations (ug/l)
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Sample Date
MW-1
MW-2
MW-4
MW-5
MW-8
MW-9
MCL
MDL

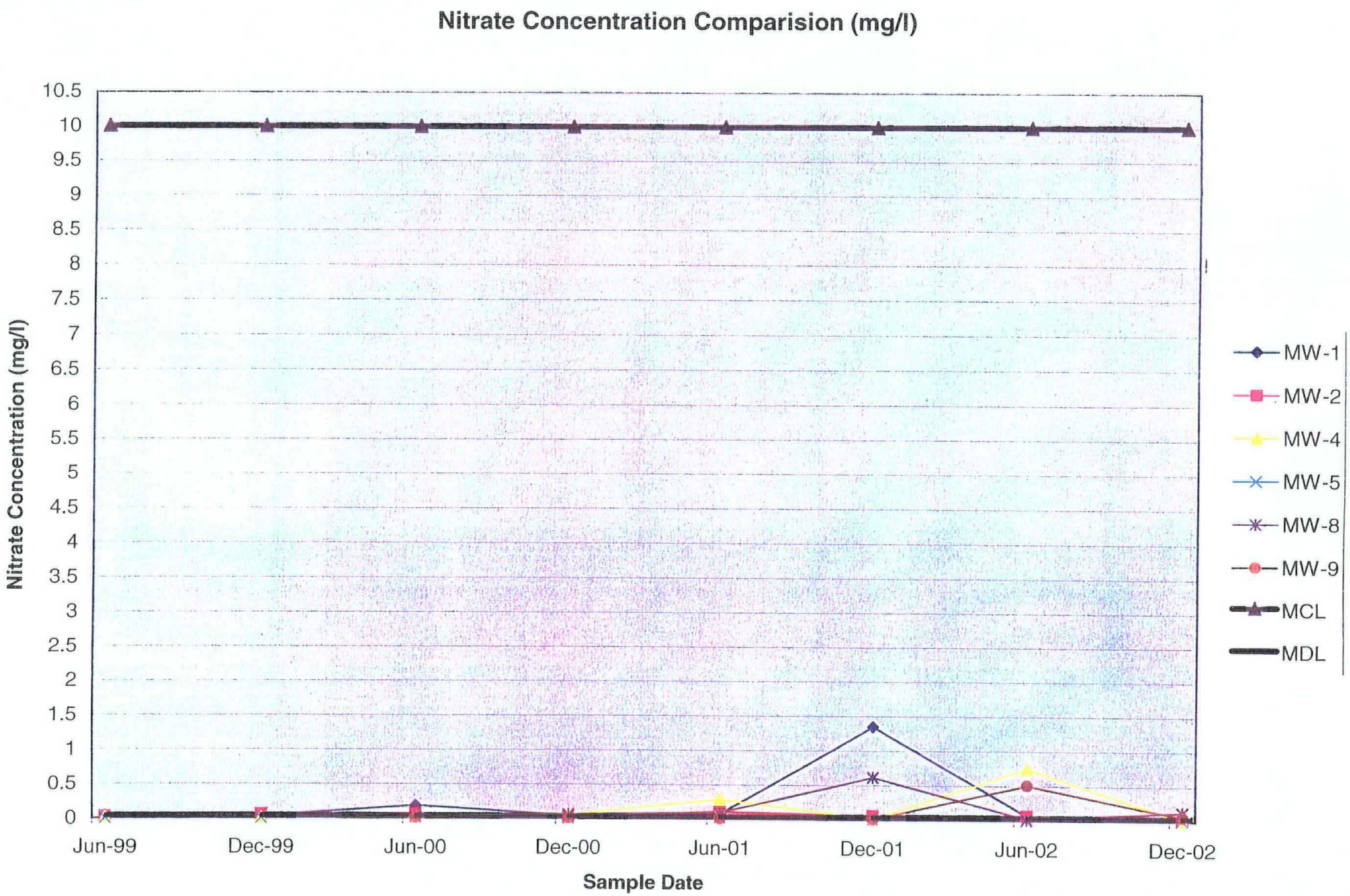

Sodium Concentration Comparisions(ug/l)
Sodium Concentration (ug/l)
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Sample Date
MW-1
MW-2
MW-4
MW-5
MW-8
MW-9
MCL
MDL


Vanadium Concentration Comparison (ug/l)
Vanadium Concentration (ug/l)
120
100
80
60
40
20
0
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Sample Date
MW-1
MW-2
MW-4
MW-5
MW-8
MW-9
MCL
MDL

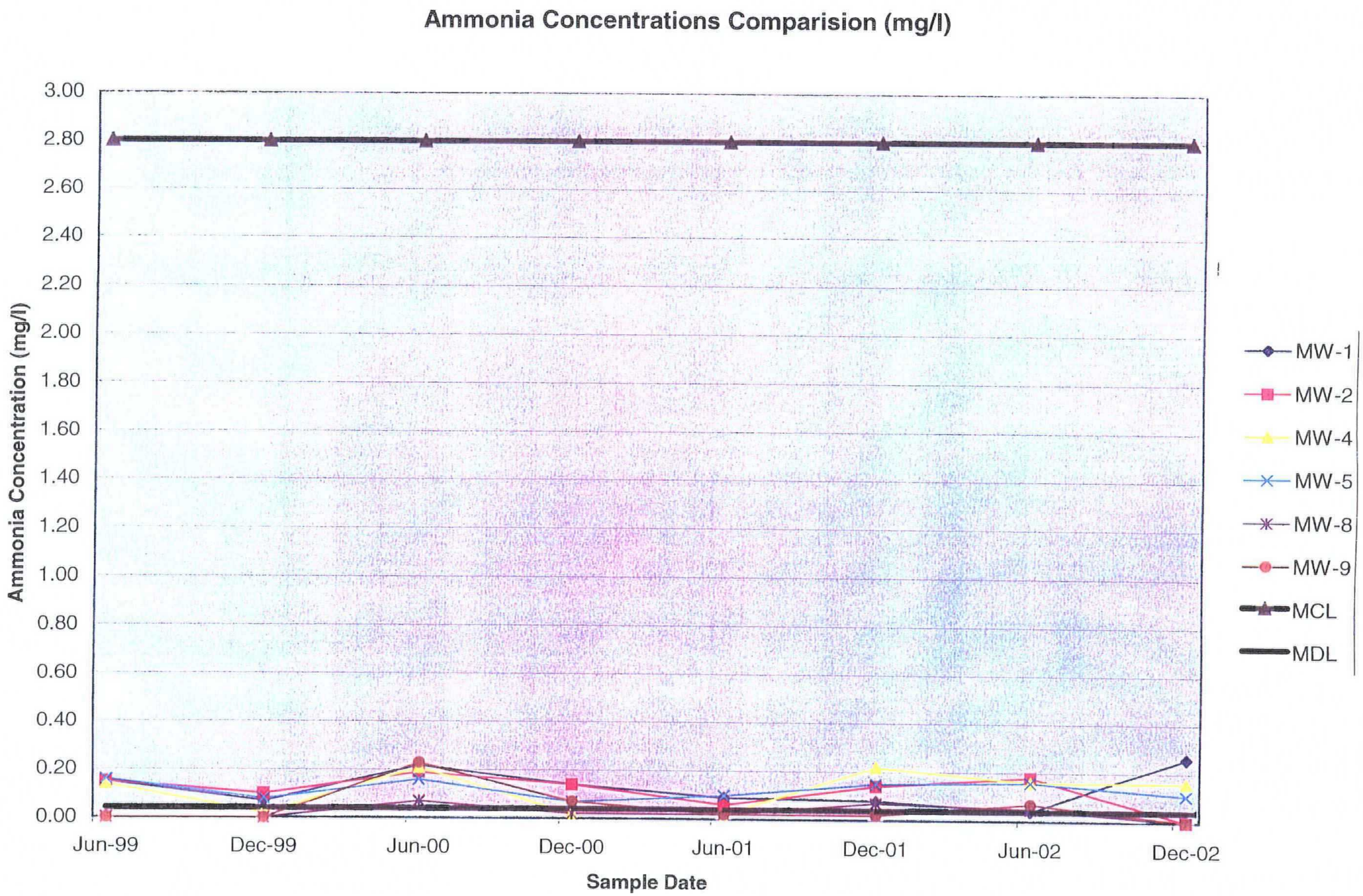

Total Dissolved Solids Concentration Comparision (mg/l)
Total Dissolved Solids Concentrations (mg/l)
600
500
400
300
200
100
0
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Sample Date
MW-1
MW-2
MW-4
MW-5
MW-8
MW-9
MCL
MDL

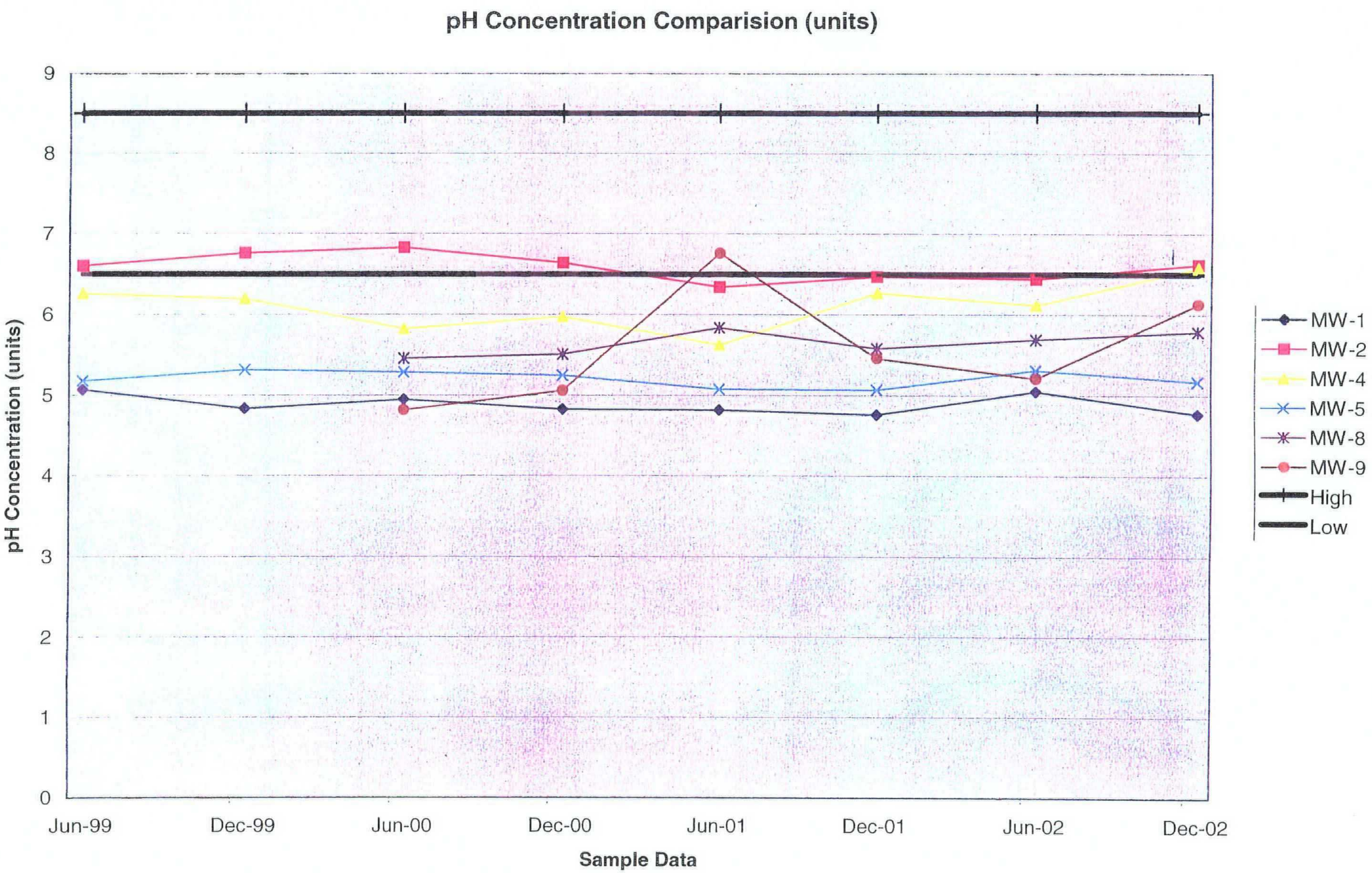


Chloride Concentration Comparision (mg/l)
300
250
200
150
100
50
0
Chloride Concentration (mg/l)
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Sample Date
MW-1
MW-2
MW-4
MW-5
MW-8
MW-9
MCL
MDL

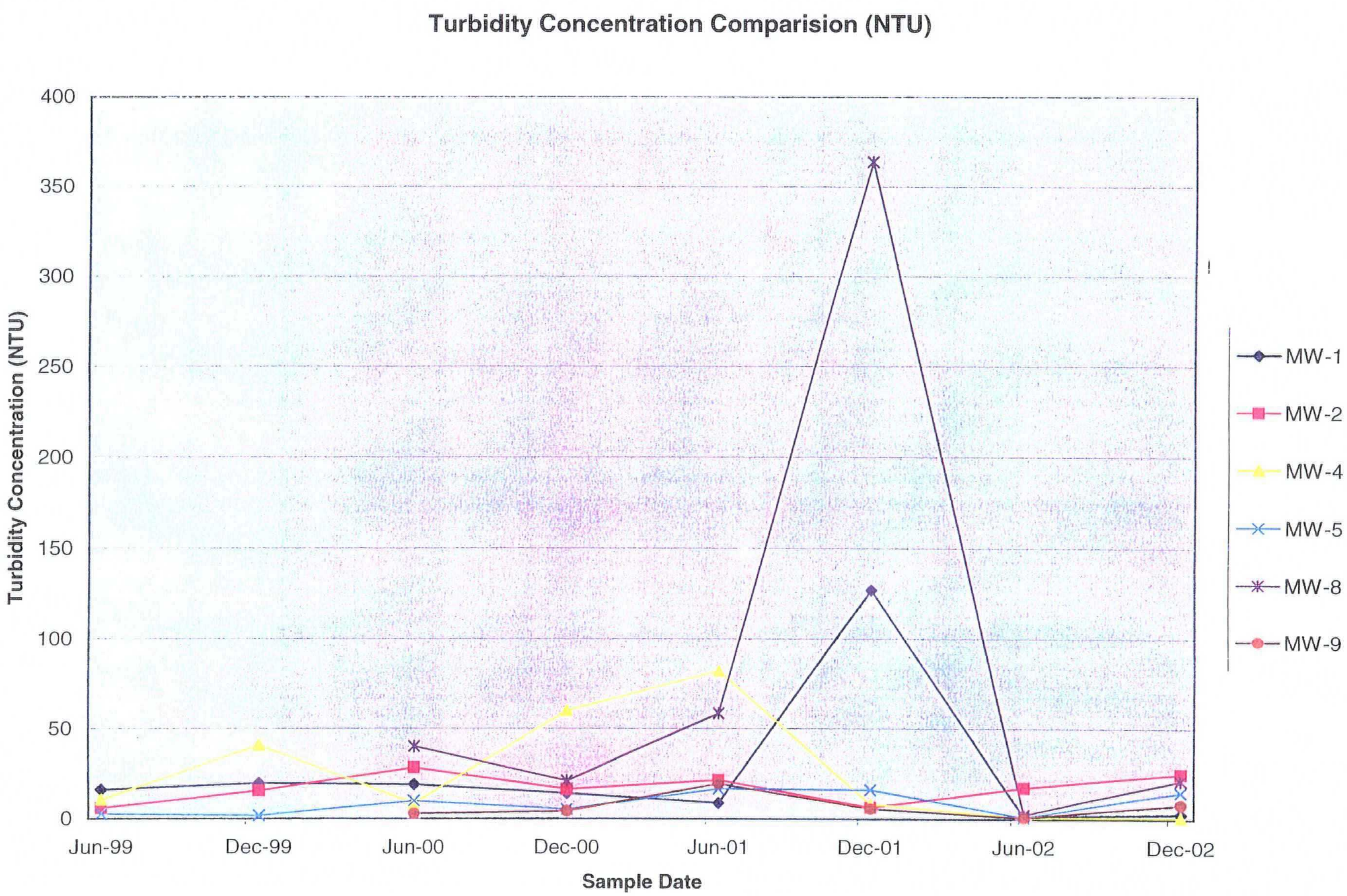


Nitrate Concentration Comparision (mg/l)
Nitrate Concentration (mg/l)
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Sample Date
MW-1
MW-2
MW-4
MW-5
MW-8
MW-9
MCL
MDL

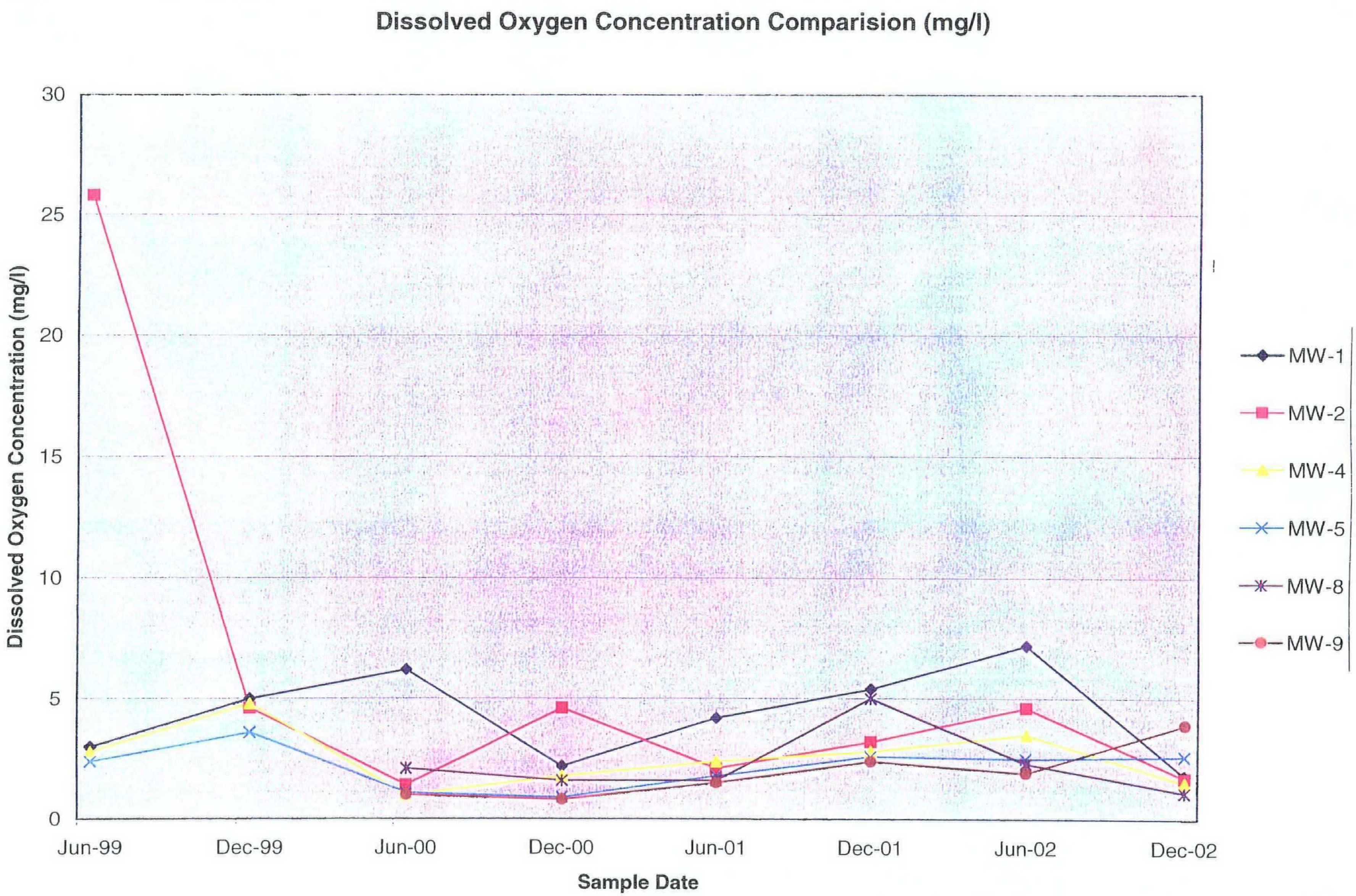

Ammonia Concentrations Comparision (mg/l)
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
Ammonia Concentration (mg/l)
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Sample Date
MW-1
MW-2
MW-4
MW-5
MW-8
MW-9
MCL
MDL



pH Concentration Comparision (units)
9
8
7
6
5
4
3
2
1
0
pH Concentration (units)
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Sample Data
MW-1
MW-2
MW-4
MW-5
MW-8
MW-9
High
Low



Turbidity Concentration Comparision (NTU)
Turbidity Concentration (NTU)
400
350
300
250
200
150
100
50
0
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Sample Date
MW-1
MW-2
MW-4
MW-5
MW-8
MW-9


Dissolved Oxygen Concentration Comparision (mg/l)
30
25
20
15
10
5
0
Dissolved Oxygen Concentration (mg/l)
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Sample Date
MW-1
MW-2
MW-4
MW-5
MW-8
MW-9

ATTACHMENT C

LEACHATE DATA SUMMARY CHART

HARDEE COUNTY
SEMI-ANNUAL LEACHATE MONITORING RESULTS

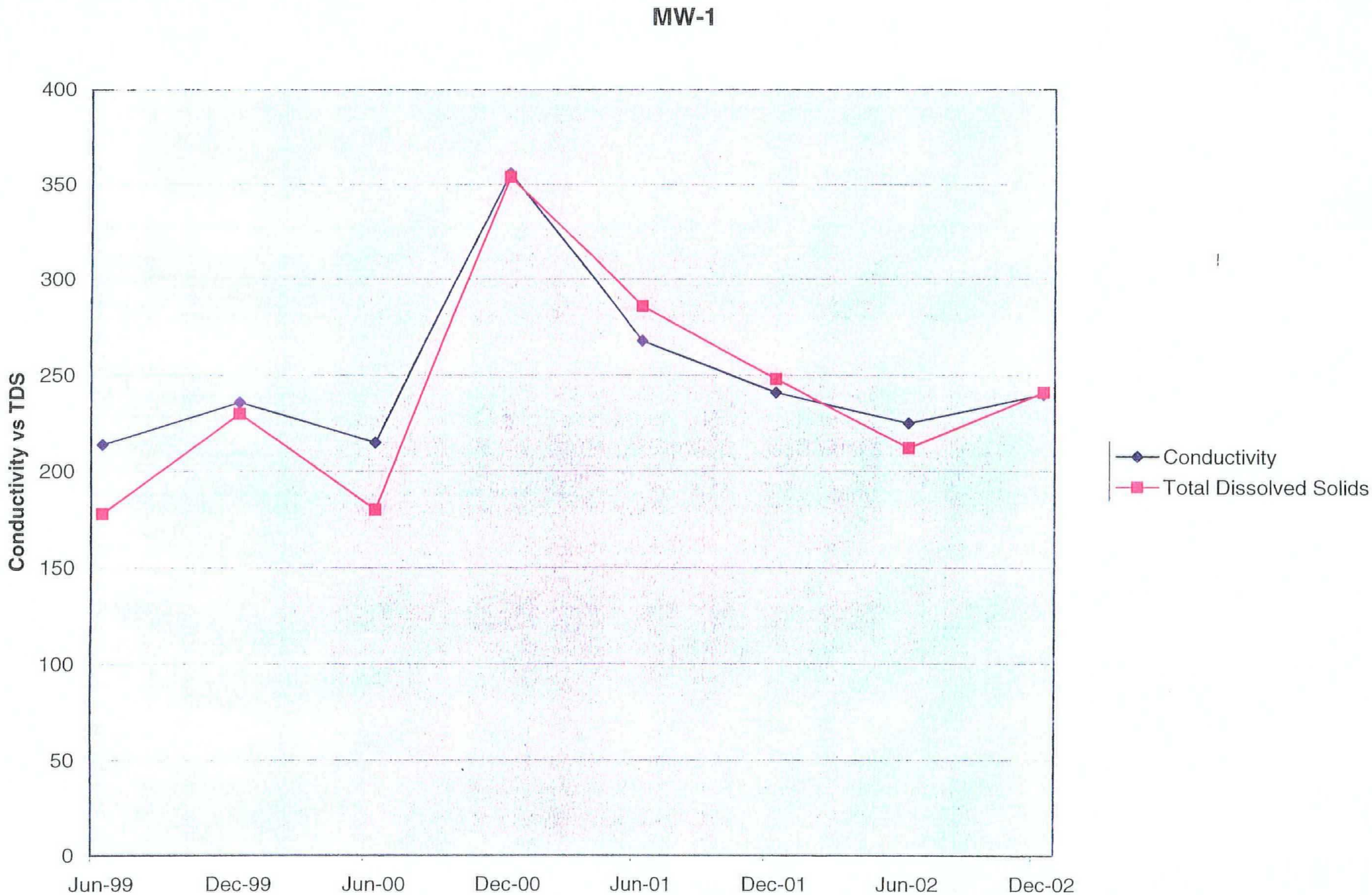
JUNE 1999-DECEMBER 2002

PARAMETER	40 CFR Chapter I-Part 261 Toxicity Characteristics	Units	Dec-99	Jun-00	Dec-00	Jun-01	Dec-01	Jun-02	Dec-02	Primary Drinking Water Standard (62-550 F.A.C.) Secondary Drinking Water Standard (62-550 F.A.C.) Groundwater Clean-up Target Level (62-777 F.A.C.)	Surface Water Criteria (62-302 F.A.C.) Groundwater Clean-up Target Level (62-777 F.A.C.)
Inorganic Parameters:											
Arsenic	5,000	µg/l.	6	32	<5.0	352	<5.0	7	6	50	50
Barium	100,000	µg/l.	30	250	40	4,600	110	40	30	2,000	unable to calculate
Beryllium	NA	µg/l.	<1.0	<1.0	<1.0	30	<1.0	<1.0	<1.0	4	0.13
Cadmium	1,000	µg/l.	<2.0	<2.0	<2.0	50	<2.0	<2.0	3	5	unable to calculate
Chromium	5,000	µg/l.	6	29	<5.0	1,630	8	6	<5	100	unable to calculate
Cobalt	NS	µg/l.	<50	<50	<50	100	<50	<50	<50	420	NA
Copper	NS	µg/l.	<10	120	<10	1,010	<10	<10	<10	1,000	unable to calculate
Iron	NS	µg/l.	27,700	72,900	3,410	793,000	10,000	1,910	12,500	300	1,000
Lead	5,000	µg/l.	<1.0	38	<1.0	1110	<1.0	5	<1	15	unable to calculate
Mercury	200	µg/l.	<1.0	<1.0	<1.0	9	<1.0	<1.0	<1.0	2	0.012
Nickel	NS	µg/l.	10	40	10	810	<10.0	20	<10	100	unable to calculate
Selenium	NS	µg/l.	<5.0	<5.0	<5.0	52	<5.0	<5.0	<5.0	50	5
Silver	5,000	µg/l.	<1.0	<1.0	<1.0	2	<1.0	<1.0	<1.0	100	0.07
Sodium	NS	µg/l.	17,000	30,000	31,000	46,000	21,000	32,000	23,000	160,000	unable to calculate
Thallium	NS	µg/l.	<2.0	5	<2.0	8	<2.0	<2.0	<2.0	2	6.3
Vanadium	NS	µg/l.	<100	<100	<100	1,270	<100	<100	<100	49	NA
Zinc	NS	µg/l.	10	590	18	4,960	<2.0	14	2	5,000	unable to calculate
Total Dissolved Solids	NS	mg/l.	282	885	400	504	276	478	168	500	NA
Alkalinity	NS	mg/l.	70	295	299	328	129	334	80.9	NA	<20
Chloride	NS	mg/l.	31	64	46	82	37	66	42	250	NA
Nitrogen, Nitrate	NS	mg/l.	0.03	0.07	0.02	0.55	0.06	0.04	<0.02	10,000	NA
Nitrogen, Nitrite	NS	mg/l.	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1,000	NA
Nitrogen Ammonia (As N)	NS	mg/l.	4.98	1.24	8.73	2.40	5.2	0.07	4.80	3	0.02
Sulfide	NS	mg/l.	0.74	---	0.13	---	0.43	---	1.06	NA	NA
Field Parameters:											
Specific Conductance (Field)	NS	umho/cm	444	729	740	846	363	759	354	NA	1,275
pH (Field)	NS	Unit	6.14	6.18	6.92	6.94	6.24	7.53	5.95	6.5-8.5	6.5-8.5
Temperature (Field)	NS	Deg C	25.4	26.6	24.2	26.2	25.5	33.8	22.5	NA	NA
Dissolved Oxygen (Field)	NS	mg/l.	3.8	0.7	0.8	0.7	3.6	6.5	2.2	NA	>5.0
Organic Parameters:											
Benzene	500	µg/l.	2.12	15.00	<0.04	<0.04	<0.04	<0.04	<1.0	1.0	71.28 annual average
Chlorobenzene	100000	µg/l.	6.81	<0.04	<0.04	<0.04	<0.04	<0.04	<1.0	100	17
1,4-Dichlorobenzene	7500	µg/l.	3.06	<0.03	0.61	<0.03	0.68	<0.03	2.22	75	100
Ethylbenzene	NS	µg/l.	0.29	3.67	<0.06	<0.06	<0.06	<0.06	<1.0	700	605
Toluene	NS	µg/l.	0.65	0.2	0.54	0.85	<0.11	<0.11	<1.0	1,000	475
Total Xylenes	NS	µg/l.	3.61	14.6	9.54	0.78	<0.11	<0.11	<1.0	10,000	370

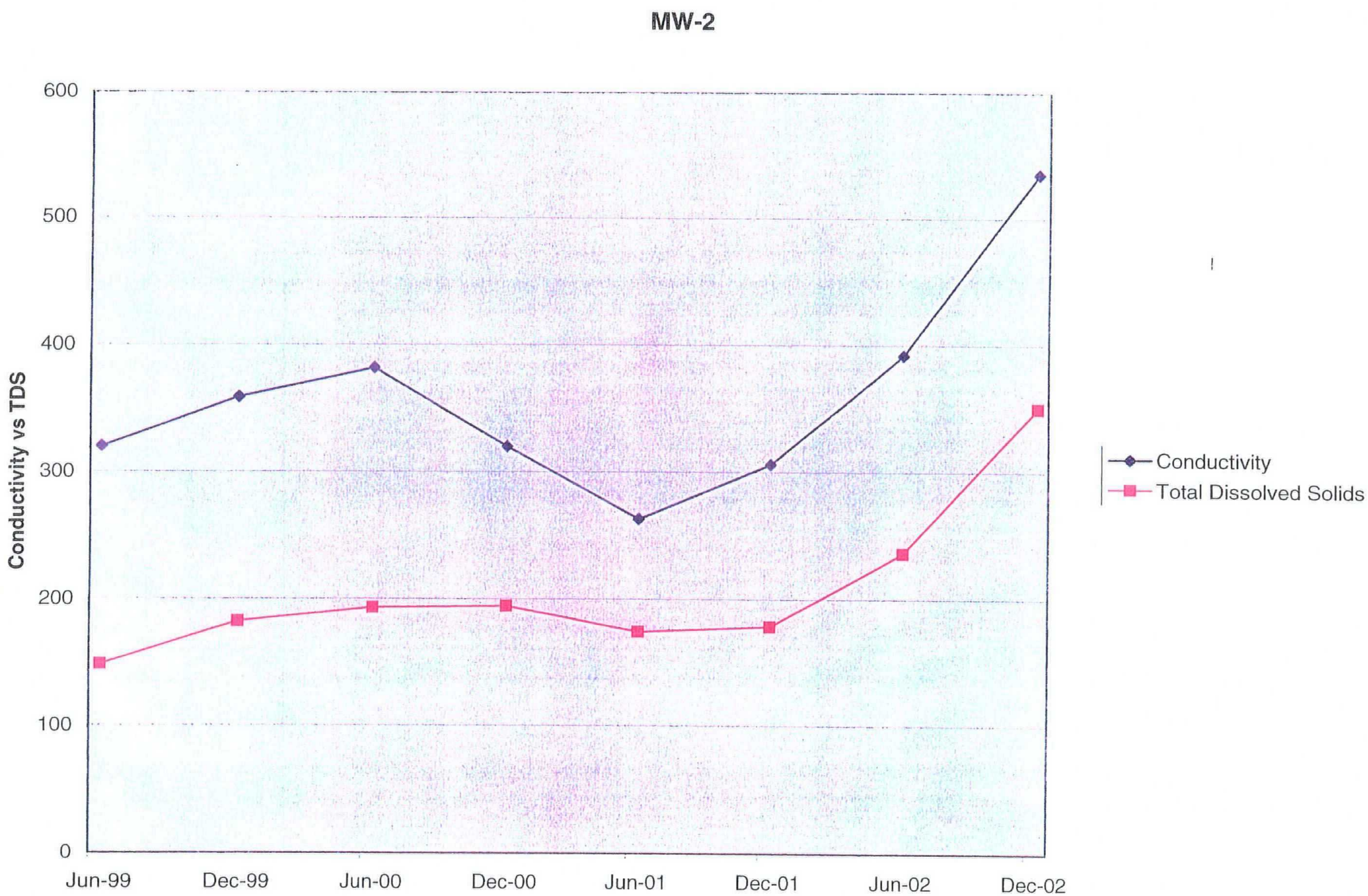
Notes:
MCL = Maximum Contaminant Level.
NA = Not Available.
NS= No Standard
--- = Not Tested.
Shaded = Sample result above the MCL. For 40 CFR Chapter I-part 261 Toxicity Standards
[1] Parameter MCL is a Primary Drinking Water Standard (62-550 F.A.C.).
[2] Parameter MCL is a Secondary Drinking Water Standard (62-550 F.A.C.).
[3] Parameter MCL is a Groundwater Clean-up Target Level (62-777 F.A.C.).
* = MCL based on 40 CFR Chapter I-Part 261 Toxicity Characteristics
unable to calculate= unable to calculate no value for hardess

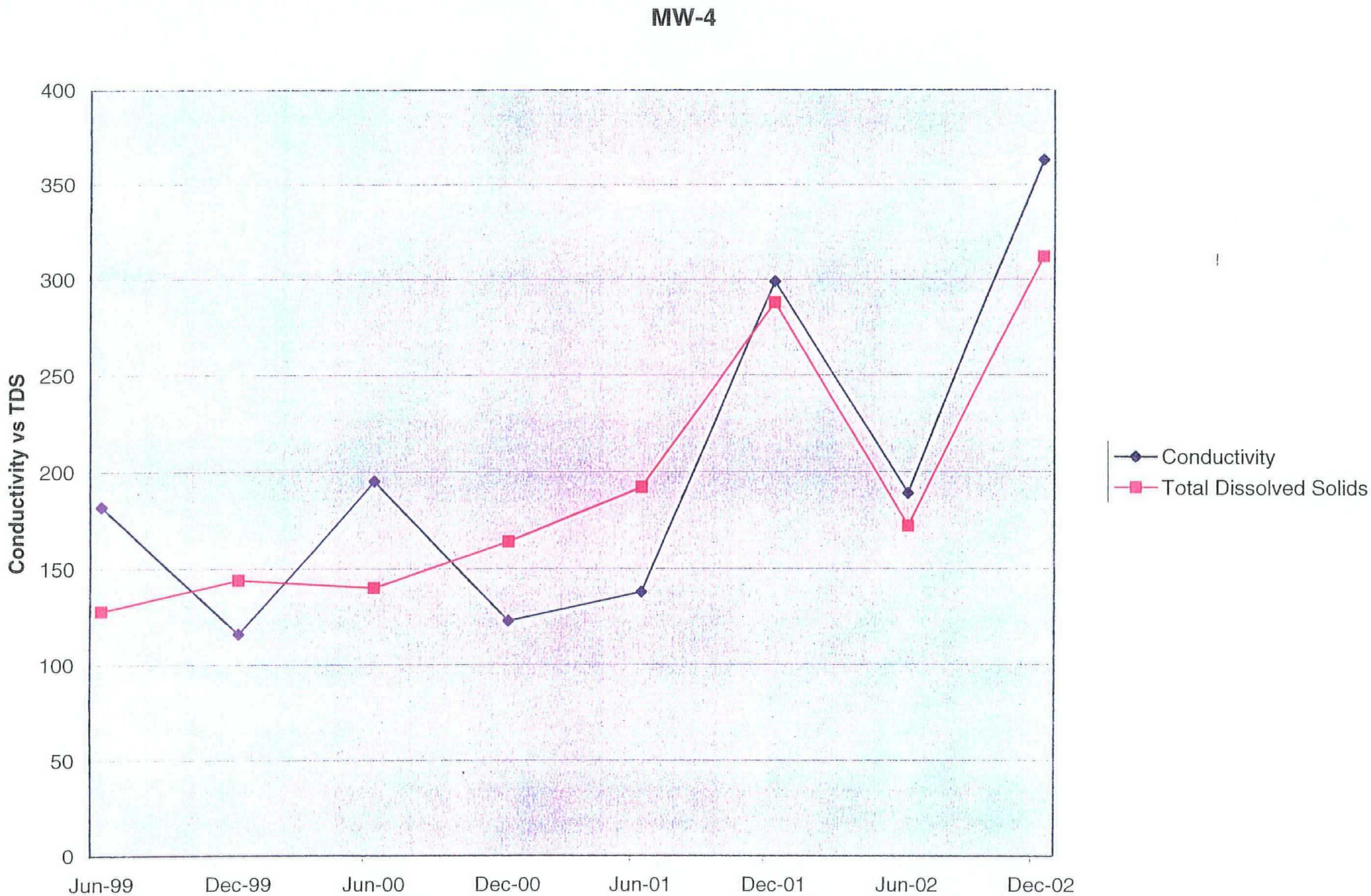
ATTACHMENT D

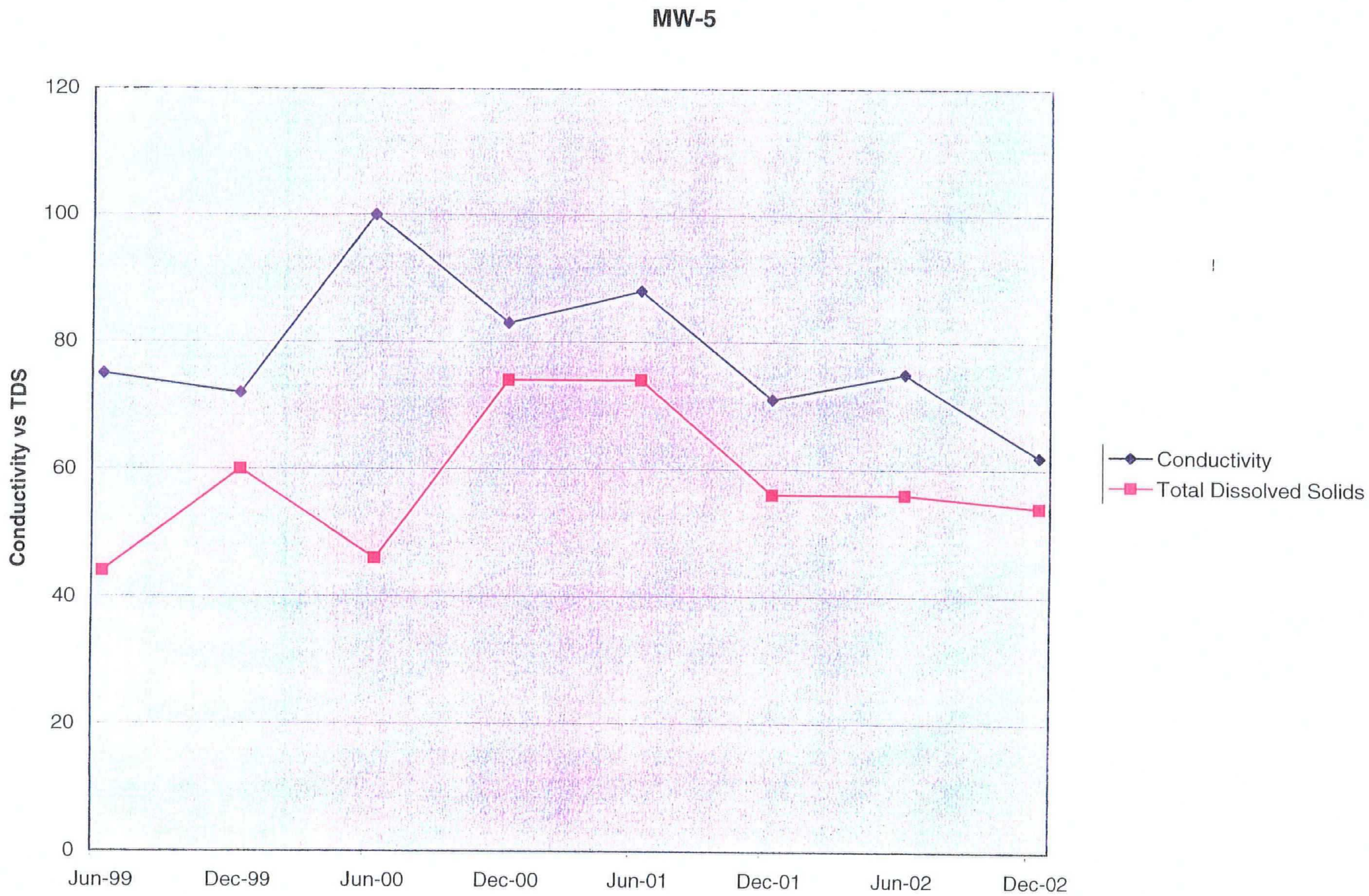
TOTAL DISSOLVED SOLIDS VS. CONDUCTIVITY FOR GROUNDWATER MONITORING WELLS



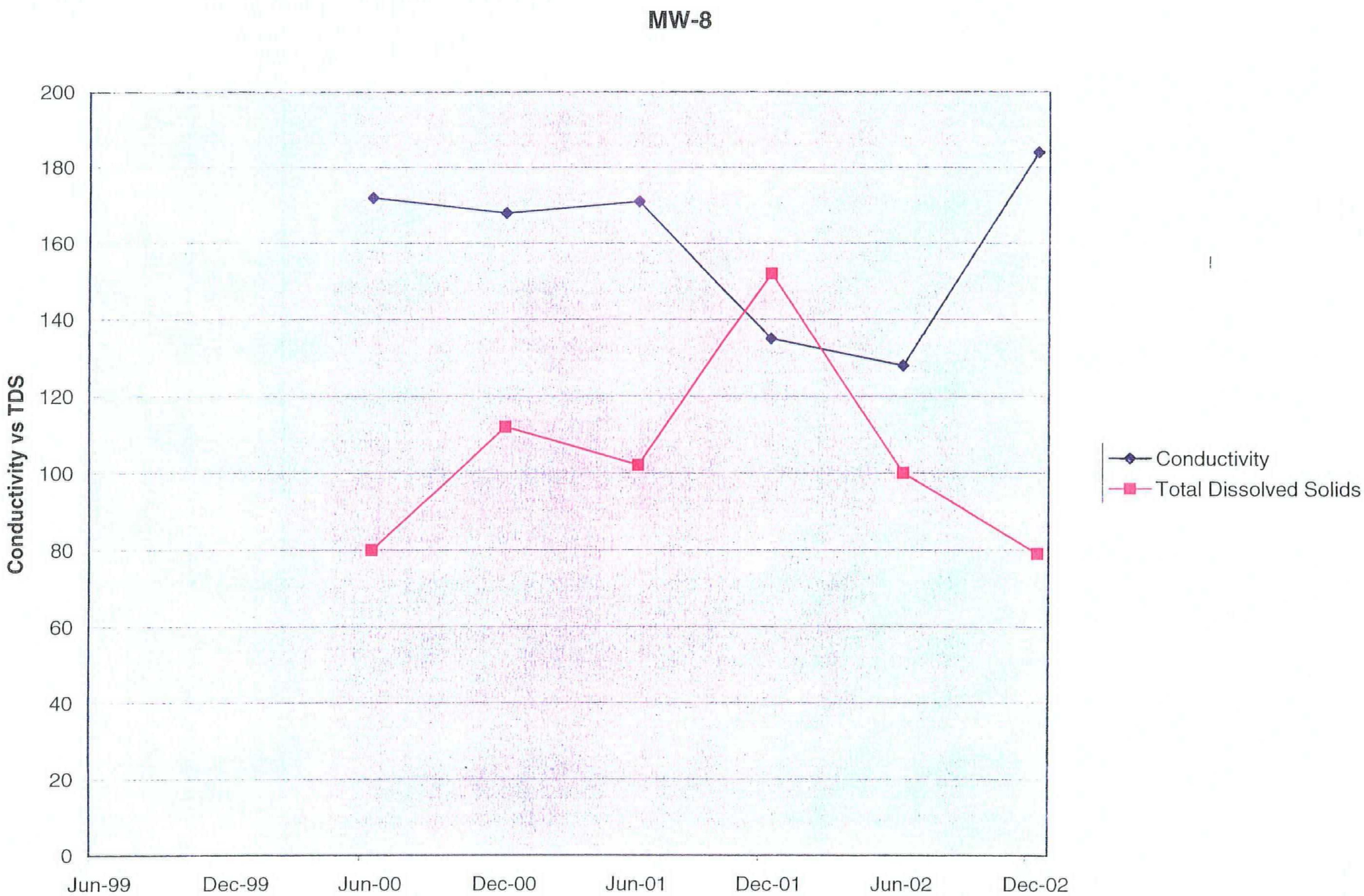
MW-1
Conductivity vs TDS
400
350
300
250
200
150
100
50
0
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Conductivity
Total Dissolved Solids

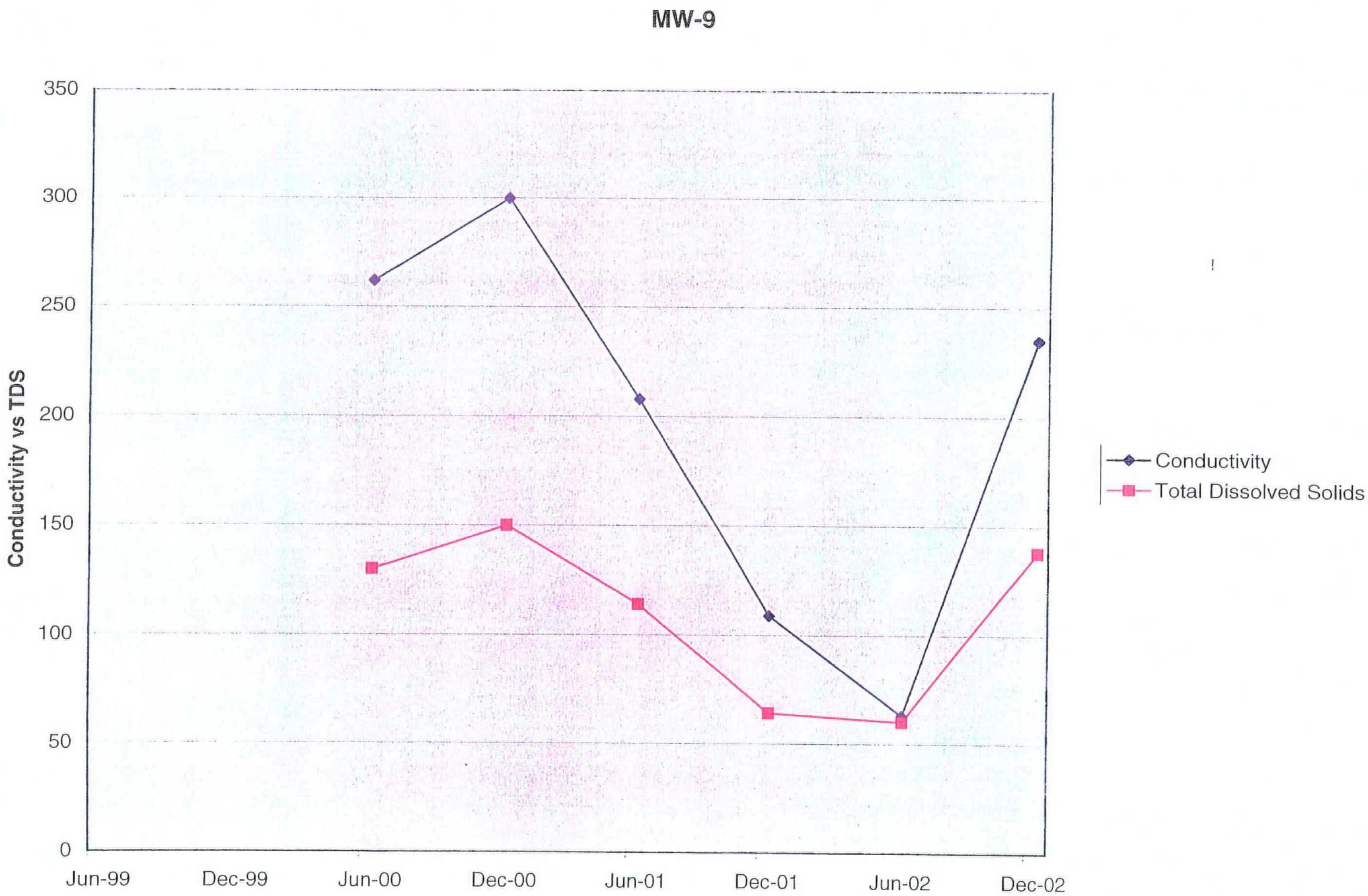

MW-2
Conductivity vs TDS
600
500
400
300
200
100
0
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Conductivity
Total Dissolved Solids


MW-4
Conductivity vs TDS
400
350
300
250
200
150
100
50
0
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Conductivity
Total Dissolved Solids



MW-5
Conductivity vs TDS
120
100
80
60
40
20
0
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Conductivity
Total Dissolved Solids


MW-8
Conductivity vs TDS
200
180
160
140
120
100
80
60
40
20
0
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Conductivity
Total Dissolved Solids


MW-9
Conductivity vs TDS
350
300
250
200
150
100
50
0
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Conductivity
Total Dissolved Solids

ATTACHMENT E

GROUNDWATER FLOW DIAGRAMS AND HYDROGRAPH

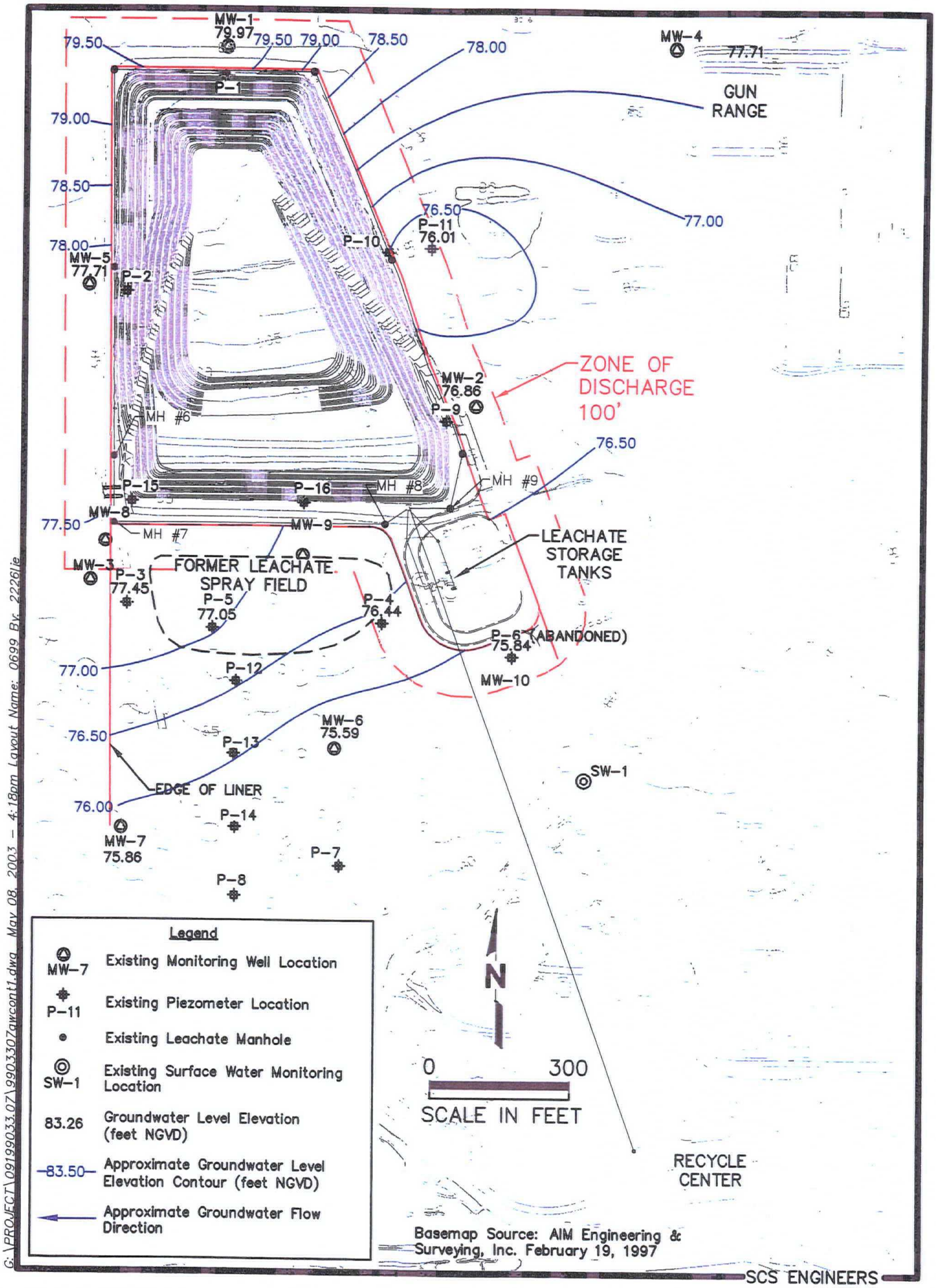


Figure E-1. Surficial Aquifer Potentiometric Map, Hardee County Solid Waste Disposal Facility
June 1999

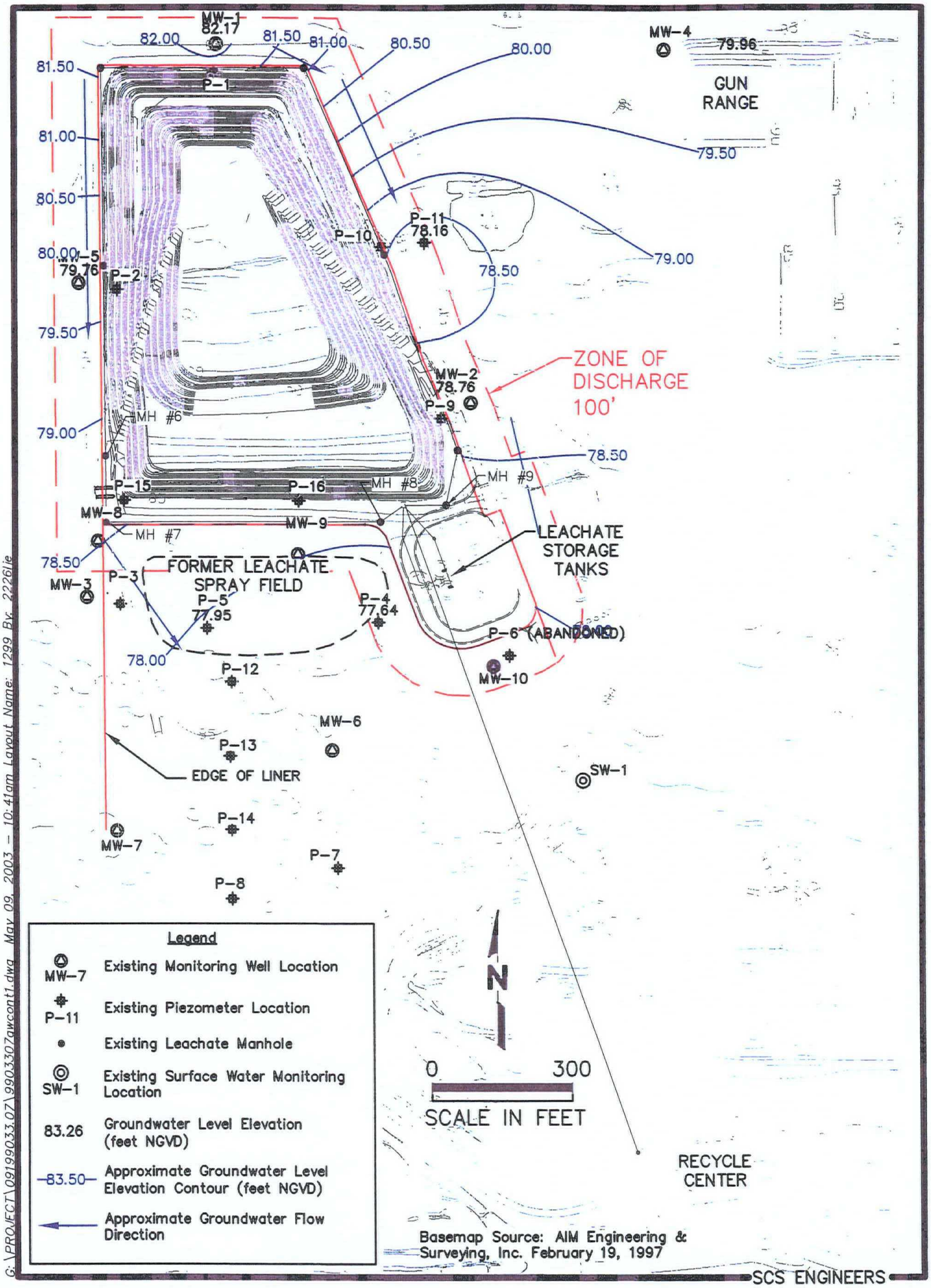


Figure E-2. Surficial Aquifer Potentiometric Map, Hardee County Solid Waste Disposal Facility December 1999

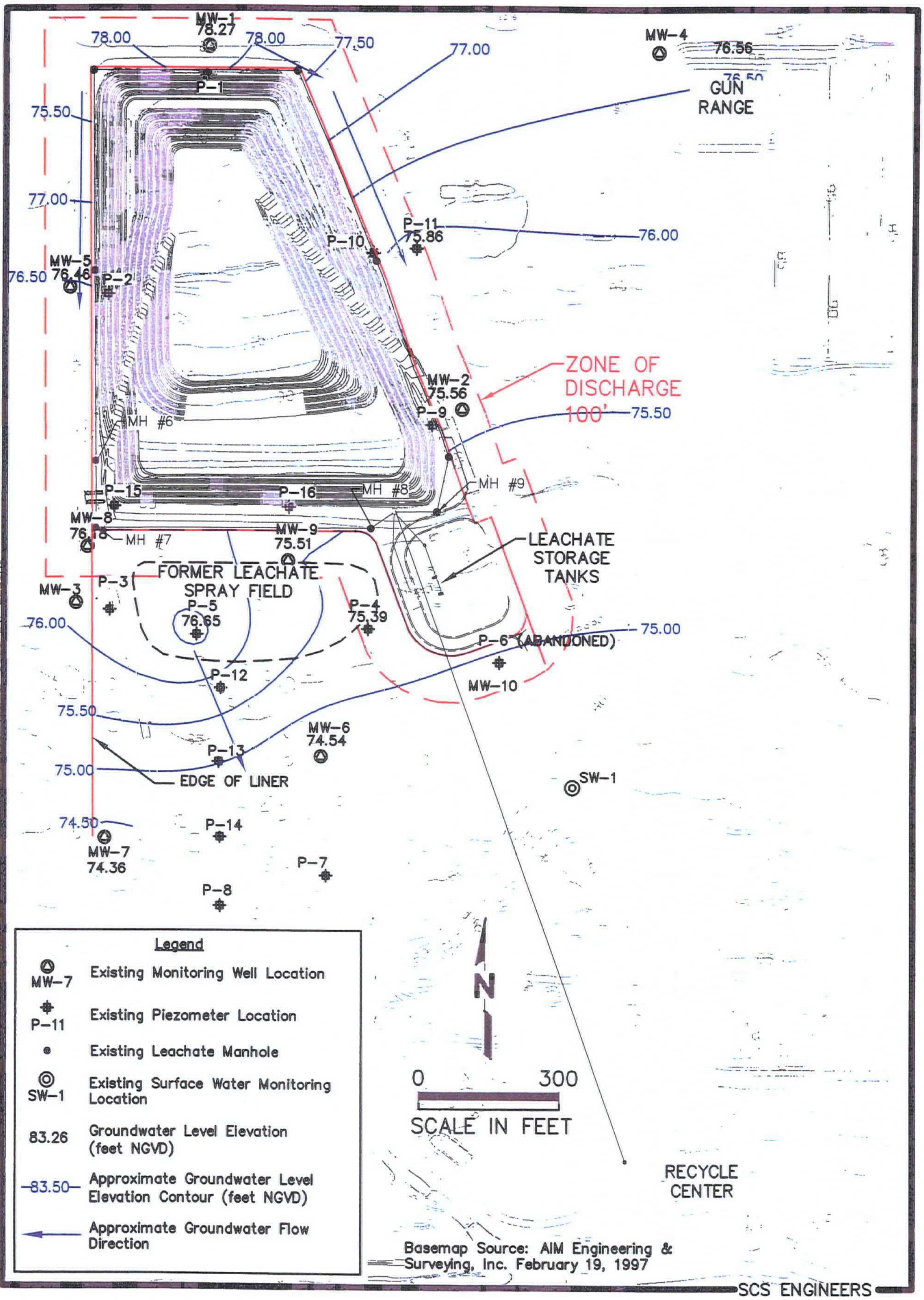


Figure E-3. Surficial Aquifer Potentiometric Map, Hardee County Solid Waste Disposal Facility June 2000

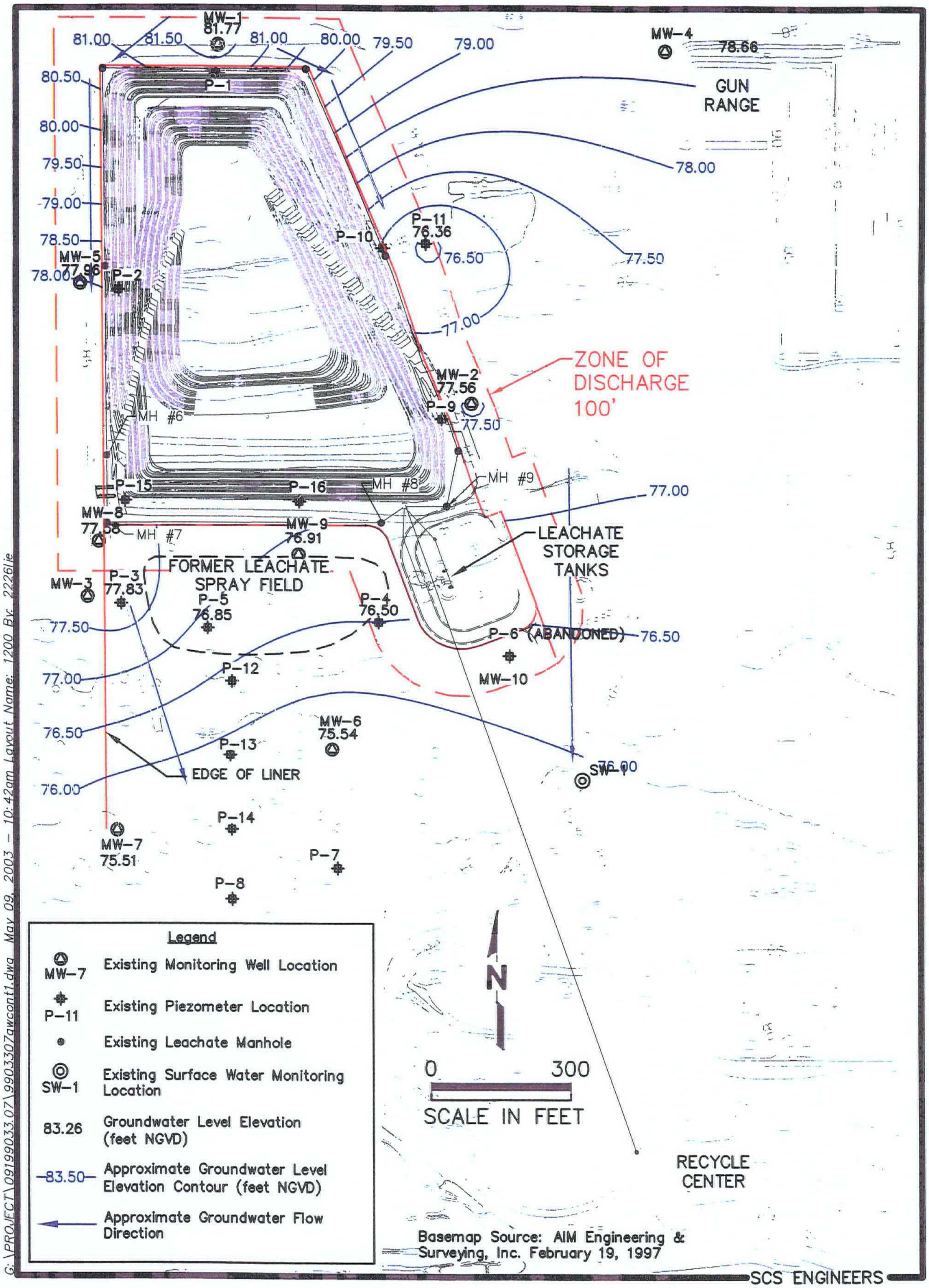


Figure E-4. Surficial Aquifer Potentiometric Map, Hardee County Solid Waste Disposal Facility
December 2000

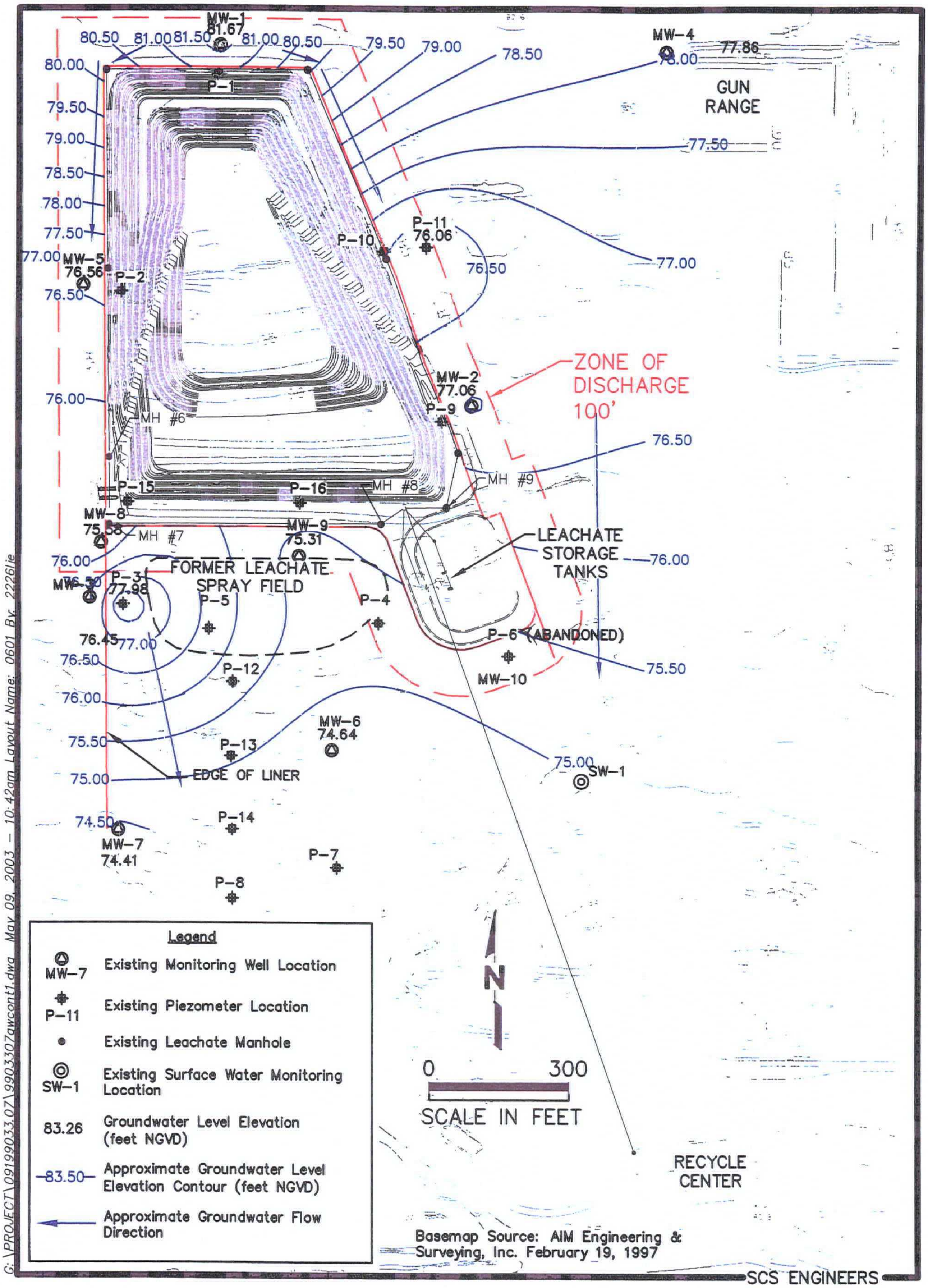


Figure E-5. Surficial Aquifer Potentiometric Map, Hardee County Solid Waste Disposal Facility June 2001

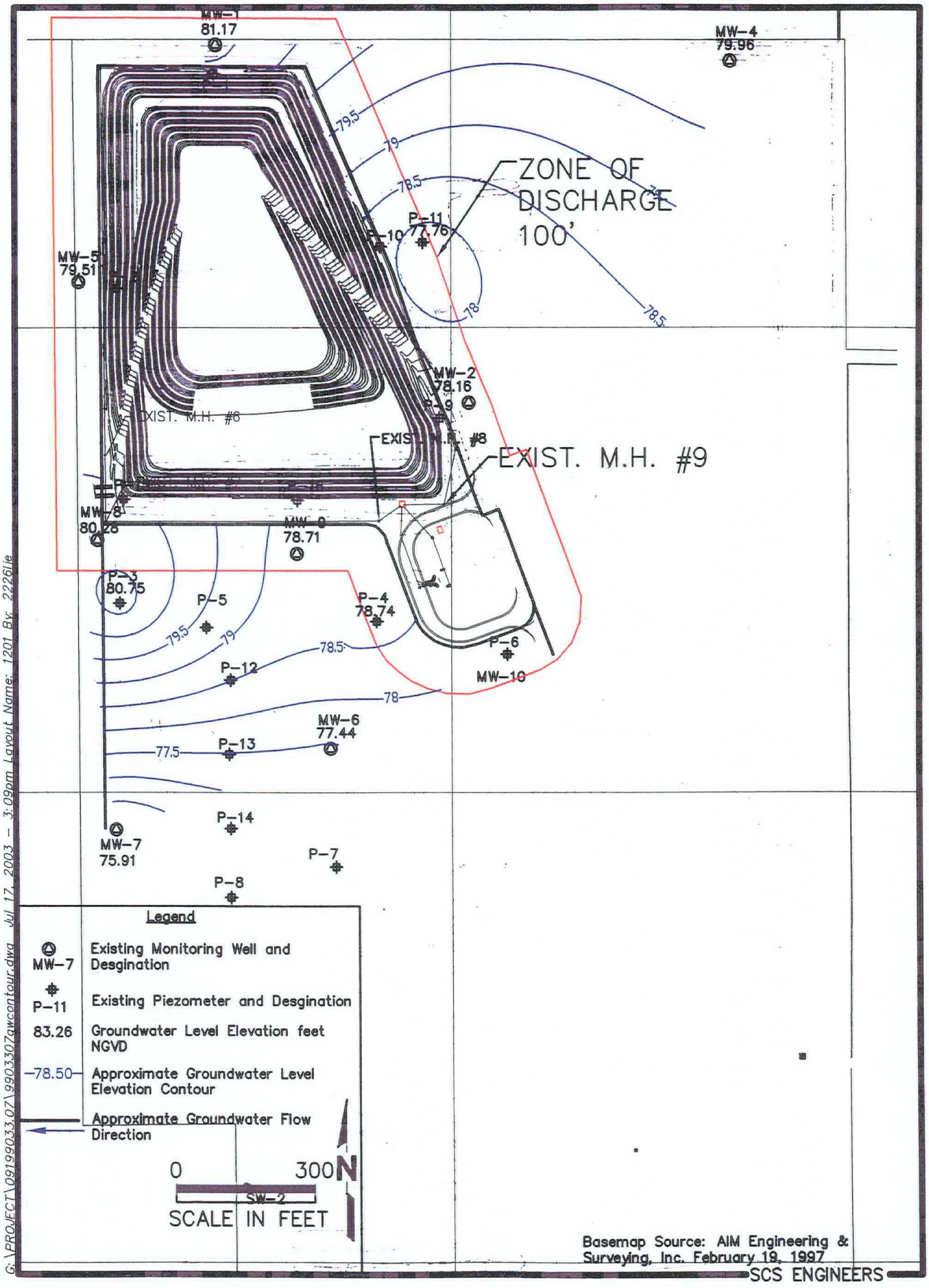


Figure E-6. Revised Groundwater Contour Map, Hardee County Solid Waste Disposal Facility December 2001

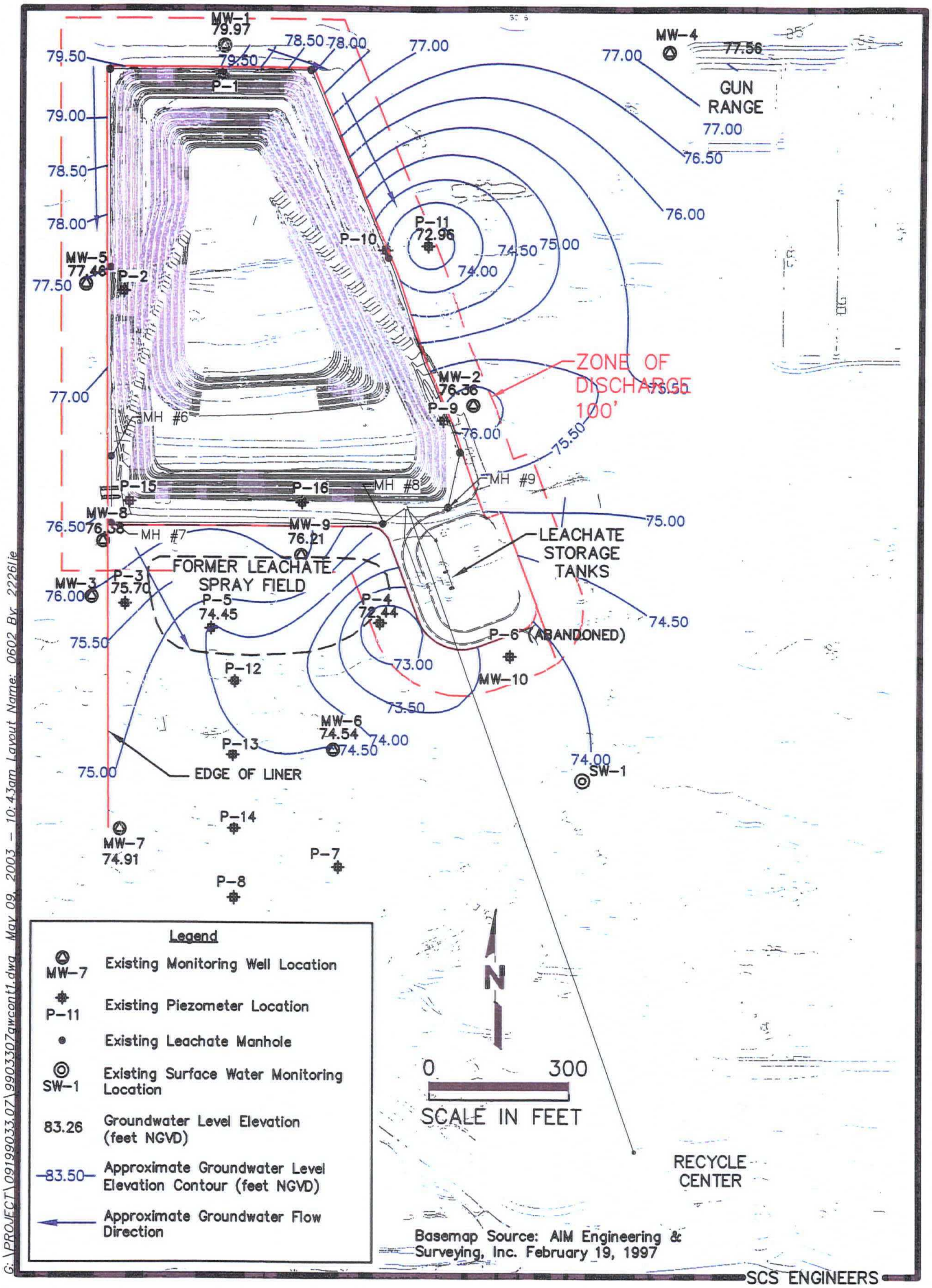


Figure E-7. Surficial Aquifer Potentiometric Map, Hardee County Solid Waste Disposal Facility
June 2002

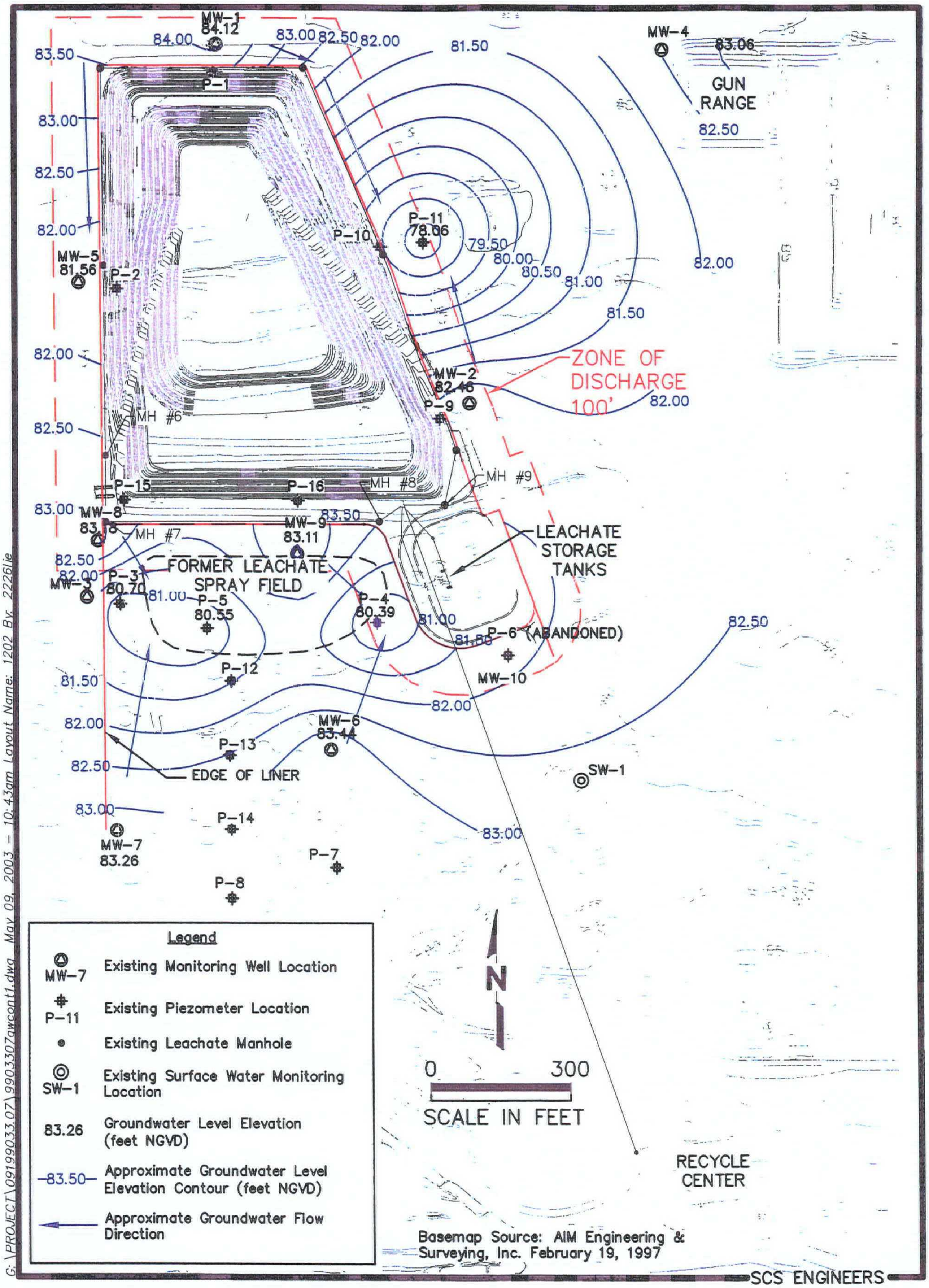


Figure E-8. Surficial Aquifer Potentiometric Map, Hardee County Solid Waste Disposal Facility December 2002

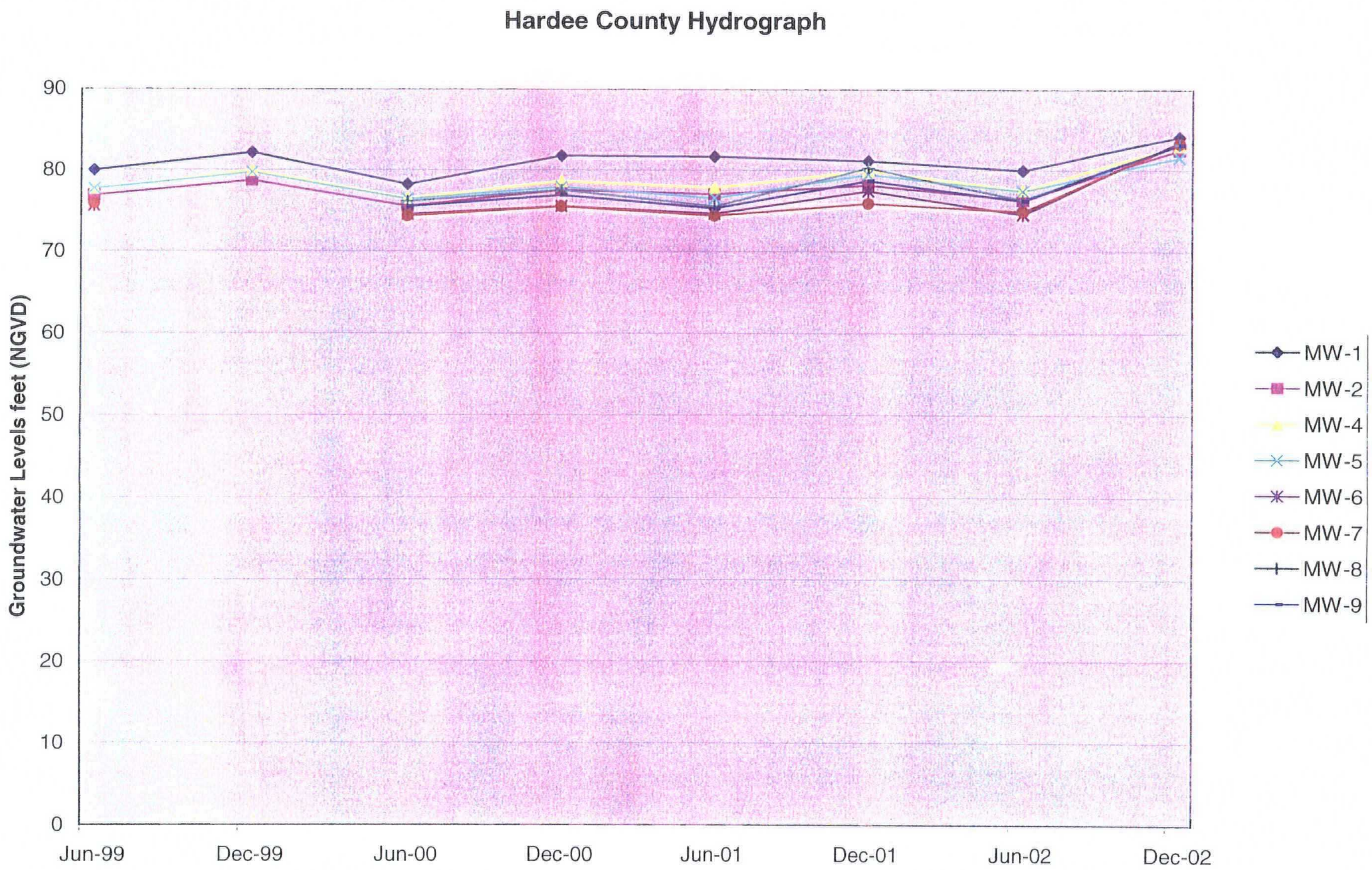
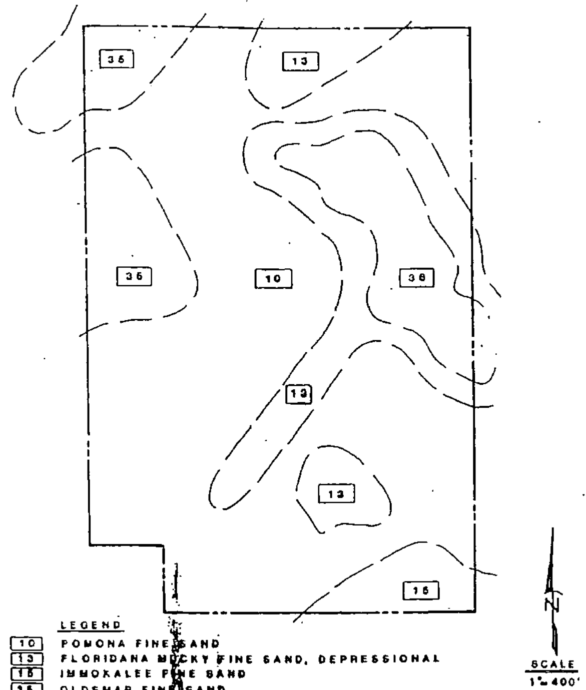

Hardee County Hydrograph
Groundwater Levels feet (NGVD)
90
80
70
60
50
40
30
20
10
0
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
MW-1
MW-2
MW-4
MW-5
MW-6
MW-7
MW-8
MW-9

Figure E-9

ATTACHMENT F

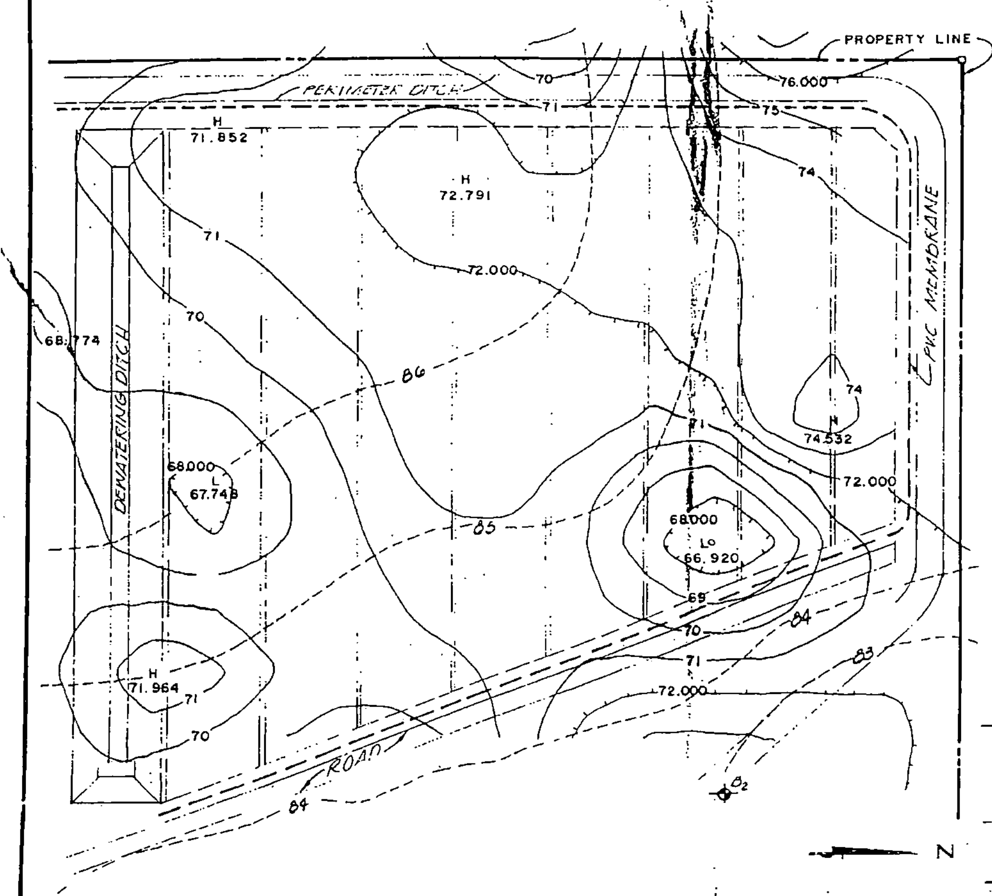
LITHOLOGIC LOGS PREPARED BY ENVISORS INC, 1982



LEGEND
- 10 POMONA FINE SAND
- 13 FLORIDANA MUCKY FINE SAND, DEPRESSIONAL
- 15 IMMOKALEE FINE SAND
- 35 OLDSMAR FINE SAND
- 86 TOMOKA MUCK
- SITE BOUNDARY
- LIMITS OF SPECIFIC SOILS ASSOCIATION

Reference: Interim Soil Survey Report, Maps and Interpretations by U.S.D.A. Soil Conservation Service.

SURFACE SOILS ASSOCIATIONS PLAN



CLAY LAYER ELEVATIONS

SCALE: 1" = 100'

NOTES

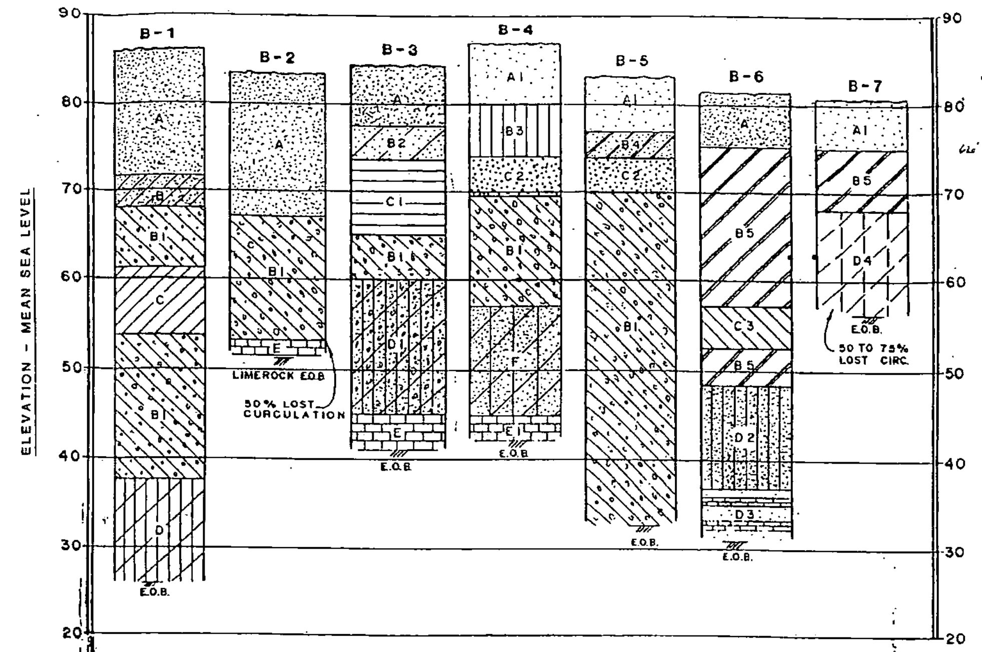
1) THIS FIGURE REPRESENTS THE RESULTS OF A REFRACTION SEISMIC SURVEY OF THE NORTHWEST CORNER OF THE SITE, PERFORMED BY ARMAC ENGINEERS, INC., 8430 NORTH 40TH STREET, TAMPA, FLORIDA 33604. THIS SURVEY WAS PERFORMED IN ORDER TO ESTABLISH THE EXISTENCE OF AND ESTIMATE THE DEPTH TO THE UNDERLYING CONFINING CLAY LAYER. CORRELATION WITH KNOWN SOIL DEPTH DATA WAS ESTABLISHED BY PERFORMING THE SURVEY IN CLOSE PROXIMITY TO PREVIOUSLY PERFORMED SPT BORINGS B-2 AND B-4. CHARACTERISTIC COMPRESSIVE WAVE VELOCITIES WERE ESTABLISHED FOR BOTH THE UPPER SURFICIAL SOILS AND UNDERLYING CLAY SOILS. THESE AVERAGE COMPRESSION WAVE VELOCITIES WERE FOUND TO BE 1362 AND 4824, RESPECTIVELY. THIS HIGH VELOCITY DIFFERENTIAL WAS USED TO IDENTIFY THESE SEPARATE SOIL STRATA.

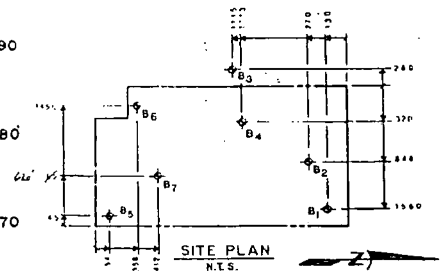
   THE FIGURE SHOWS THE RESULTS OF THIS SEISMOGRAPH INVESTIGATION WHICH INDICATE THAT THE UNDERLYING COHESIVE CLAY LAYER IS ESTIMATED TO LIE AT DEPTHS RANGING FROM ABOUT 8.4 TO 18.0 FEET BELOW GROUND SURFACE (ELEVATION 67.8 TO 77.3 FEET MSL). THE COHESIVE SOIL STRATA WAS FOUND TO BE CONTINUOUS IN THE SUBJECT AREA, BUT POSSIBLE HIGH VELOCITY HARDPAN OR SURFICIAL CLAY LAYERS WERE FOUND TO EXIST AT THREE OUT OF 22 SURVEY GRID LOCATIONS. THESE NEAR-SURFACE HIGH VELOCITY SOIL LAYERS PRODUCED ANOMALOUS WAVE REVERSALS PREVENTING DEEPER SOIL ANALYSIS AT THESE LOCATION.

2) CLAY CONTOURS AT ONE FOOT (1') INTERVALS.

LEGEND

- —68.000— SUBSURFACE CLAY CONTOUR W/ELEVATION
- L LOW CLAY
- H HIGH CLAY
- ---86---- GROUND CONTOUR
- BORING LOCATION
- - - - - - - IMPERMEABLE PVC MEMBRANE BARRIER



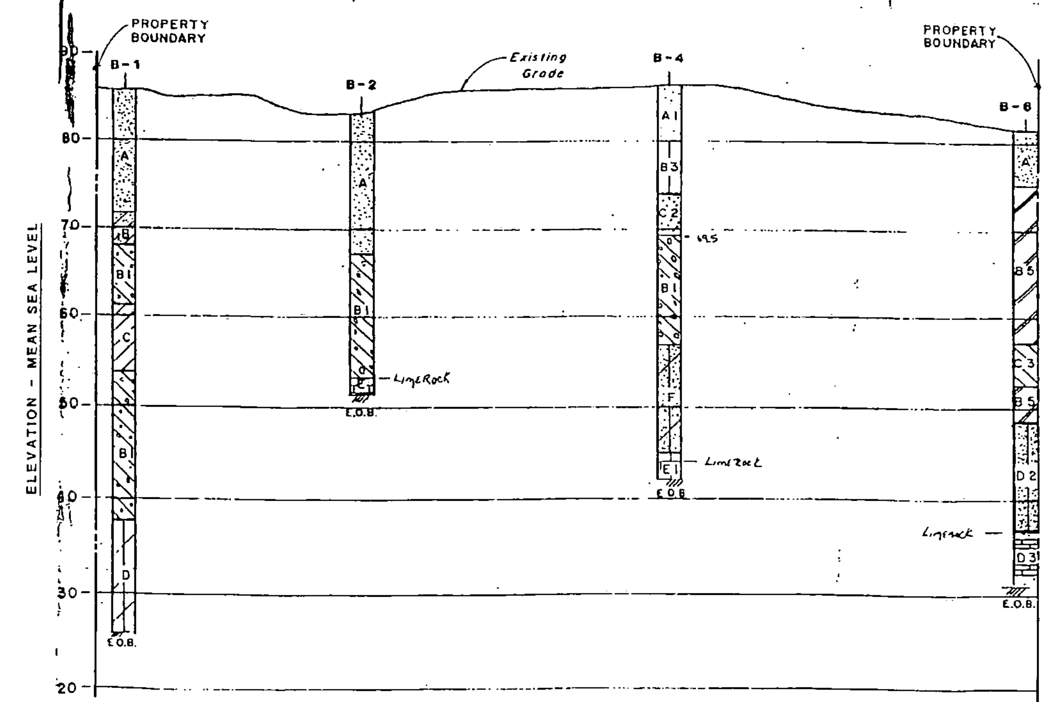


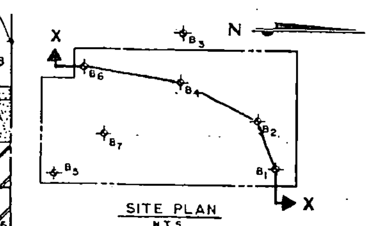
LEGEND

A	GRAY & BROWN SAND
A1	BROWN SAND
B	CLAYEY SAND
B1	GRAY-GREEN SANDY CLAY W/ PHOSPHATE
B2	GRAY SANDY CLAY
B3	HARDPAN
B4	GRAY CLAYEY SAND
B5	GRAY-GREEN SANDY CLAY
C	HARD GRAY-GREEN CLAY
C1	GREEN CLAY
C2	GRAY SAND
C3	GRAY-GREEN CLAY
D	GREEN SANDY CALCAREOUS
D1	GRAY-GREEN CALCAREOUS SANDY CLAY W/ PHOSPHATE
D2	GRAY-GREEN CALCAREOUS
D3	GRAY-GREEN CALCAREOUS CLAY W/ L.R LENSES
D4	GRAY TO TAN CALCAREOUS SANDY CLAY
E	GREENISH GRAY CLAYEY LIMEROCK W/ PHOSPHATE
E1	GREENISH GRAY LIMEROCK & SANDY CLAY
F	YELLOW MOTTLED GRAY-GREEN SANDY CLAY

SOIL BORING PROFILES

NOTE: ALL SUBSURFACE SOILS WORK CONDUCTED BY ARMAC ENGINEERING, INC., TAMPA, FLORIDA.





SECTION X-X

LEGEND

A	GRAY & BROWN SAND
A1	BROWN SAND
B	CLAYEY SAND
B1	GRAY-GREEN SANDY CLAY W/ PHOSPHATE
B2	GRAY SANDY CLAY
B3	HARDPAN
B4	GRAY CLAYEY SAND
B5	GRAY-GREEN SANDY CLAY
C	HARD GRAY-GREEN CLAY
C1	GREEN CLAY
C2	GRAY SAND
C3	GRAY-GREEN CLAY
D	GREEN SANDY CALCAREOUS
D1	GRAY-GREEN CALCAREOUS SANDY CLAY W/ PHOSPHATE
D2	GRAY-GREEN CALCAREOUS
D3	GRAY-GREEN CALCAREOUS CLAY W/ L.R. LENSES
D4	GRAY TO TAN CALCAREOUS SANDY CLAY
E	GREEMISH GRAY CLAYEY LIMEROCK W/ PHOSPHATE
E1	GREEMISH GRAY LIMEROCK & SANDY CCAY
F	YELLOW MOTTLED GRAY-GREEN SANDY CLAY

D.E.P.
JUN - 6 1997
TAMPA

RECORD DRAWING

NOTE: The information presented hereon is based upon drawings, specifications, addenda, shop drawings, modifications, etc. annotated by the contractor during the construction period to reflect the in-situ parameters of the improvements be constructed.

The Engineer, Envisors, Inc., is not responsible for the accuracy or validity of the Record Drawing information depicted hereon.

HARDEE COUNTY, FLORIDA
REGIONAL SANITARY LANDFILL

SOILS INFORMATION

Florida Registered Professional Engineer No. 13097

ENVISORS, Inc.
Consulting Civil & Environmental Engineers
Economists, and Planners
WINTER HAVEN, TAMPA, & MARGATE, FLORIDA

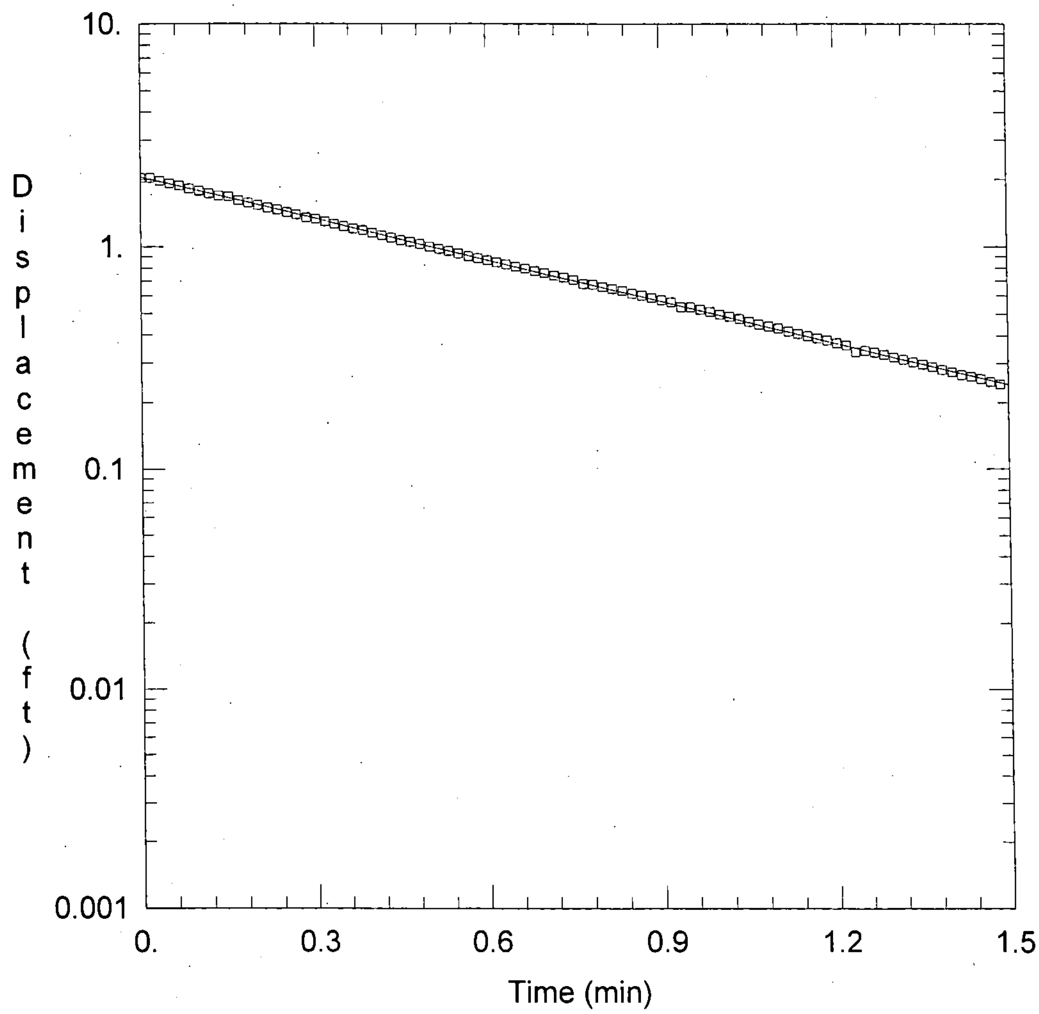
Designed	—
Drawn	C.S.L
Checked	D.D.
Approved	D.D.
Job No	81014
Date	10/82

No.	Date	Revision Description	By	Chk.
1		New Sheet	DD	

SHEET NUMBER
3
OF 14 SHEETS

ATTACHMENT I-3

AQUIFER PERFORMANCE (SLUG TEST)



WELL TEST ANALYSIS

Data Set: F:\PROJECT\HARDEE\09199033.07\BIENNIAL\SLUGTEST\MW-4A.AQT
Date: 06/26/03 Time: 08:52:44

PROJECT INFORMATION

Company: SCS
Client: Hardee County
Project: 09199033.07
Test Location: Hardee County
Test Well: MW-4A
Test Date: 06/02/03

AQUIFER DATA

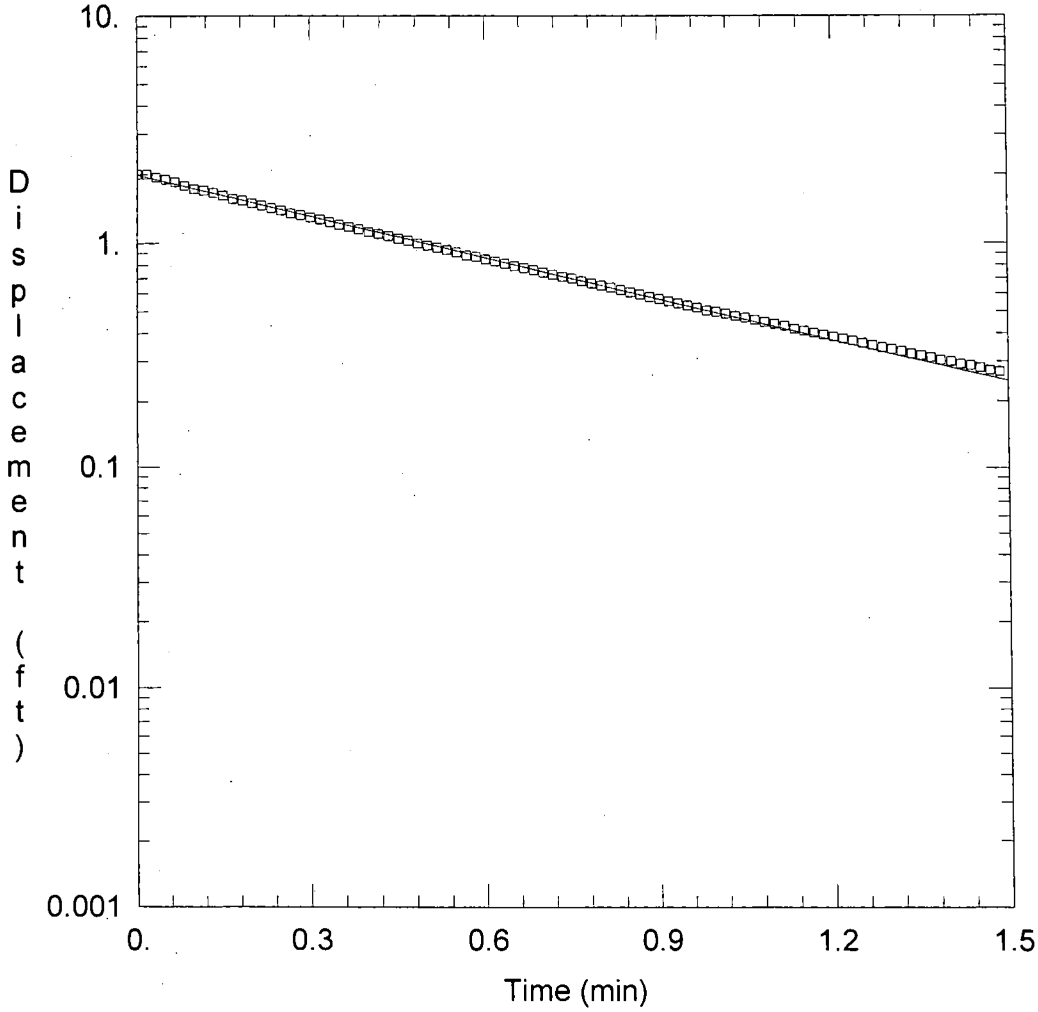
Saturated Thickness: 19.96 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Initial Displacement: 2.034 ft
Casing Radius: 0.08333 ft
Screen Length: 10. ft
Water Column Height: 15.68 ft
Wellbore Radius: 0.1958 ft
Gravel Pack Porosity: 0.25

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.003085 ft/min
y0 = 2.052 ft



WELL TEST ANALYSIS

Data Set: F:\PROJECT\HARDEE\09199033.07\BIENNIAL\SLUGTEST\MW-4B.AQT
Date: 06/26/03 Time: 08:53:27

PROJECT INFORMATION

Company: SCS
Client: Hardee County
Project: 09199033.07
Test Location: Hardee County
Test Well: MW-4B
Test Date: 06/02/03

AQUIFER DATA

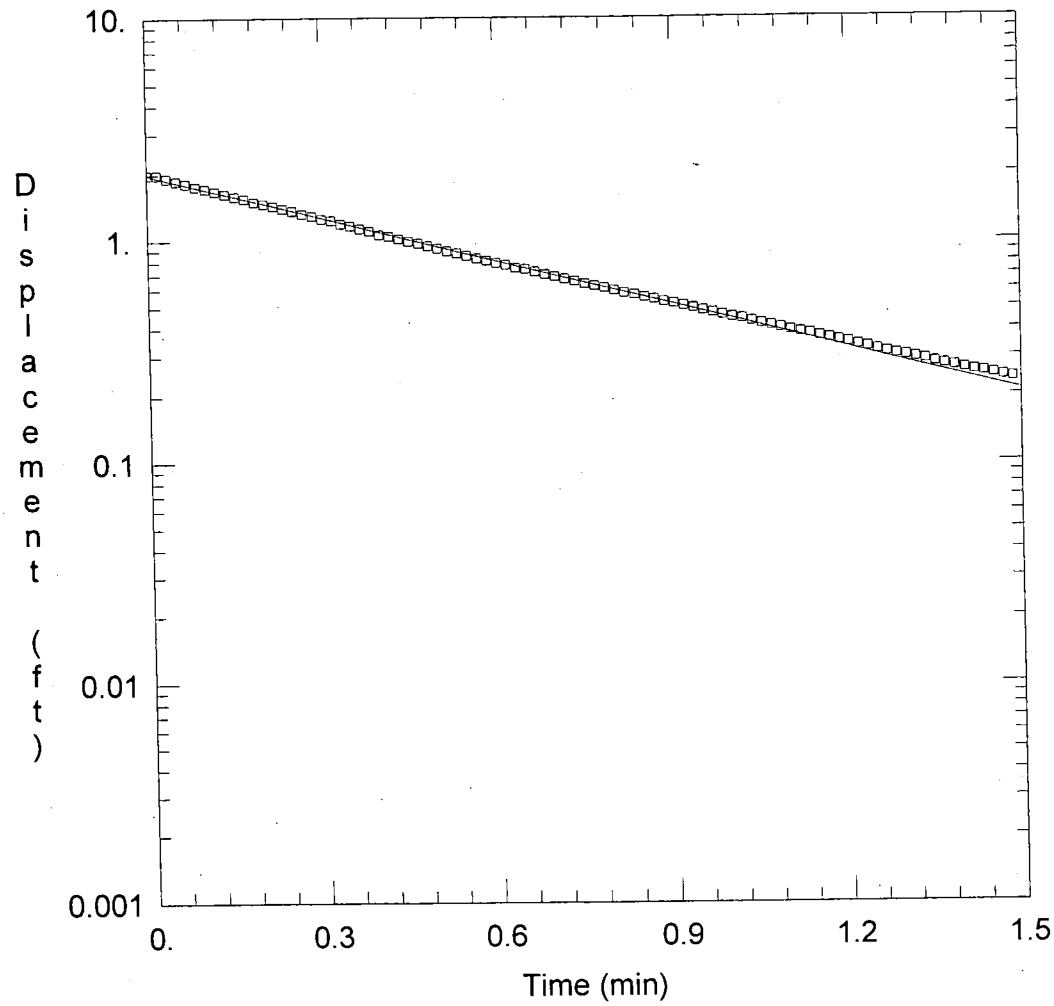
Saturated Thickness: 19.96 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Initial Displacement: 2.004 ft
Casing Radius: 0.08333 ft
Screen Length: 10. ft
Water Column Height: 15.68 ft
Wellbore Radius: 0.1958 ft
Gravel Pack Porosity: 0.25

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.003013 ft/min
y0 = 1.99 ft



WELL TEST ANALYSIS

Data Set: F:\PROJECT\HARDEE\09199033.07\BIENNIAL\SLUGTEST\MW-4C.AQT
Date: 06/26/03 Time: 08:53:59

PROJECT INFORMATION

Company: SCS
Client: Hardee County
Project: 09199033.07
Test Location: Hardee County
Test Well: MW-4C
Test Date: 06/02/03

AQUIFER DATA

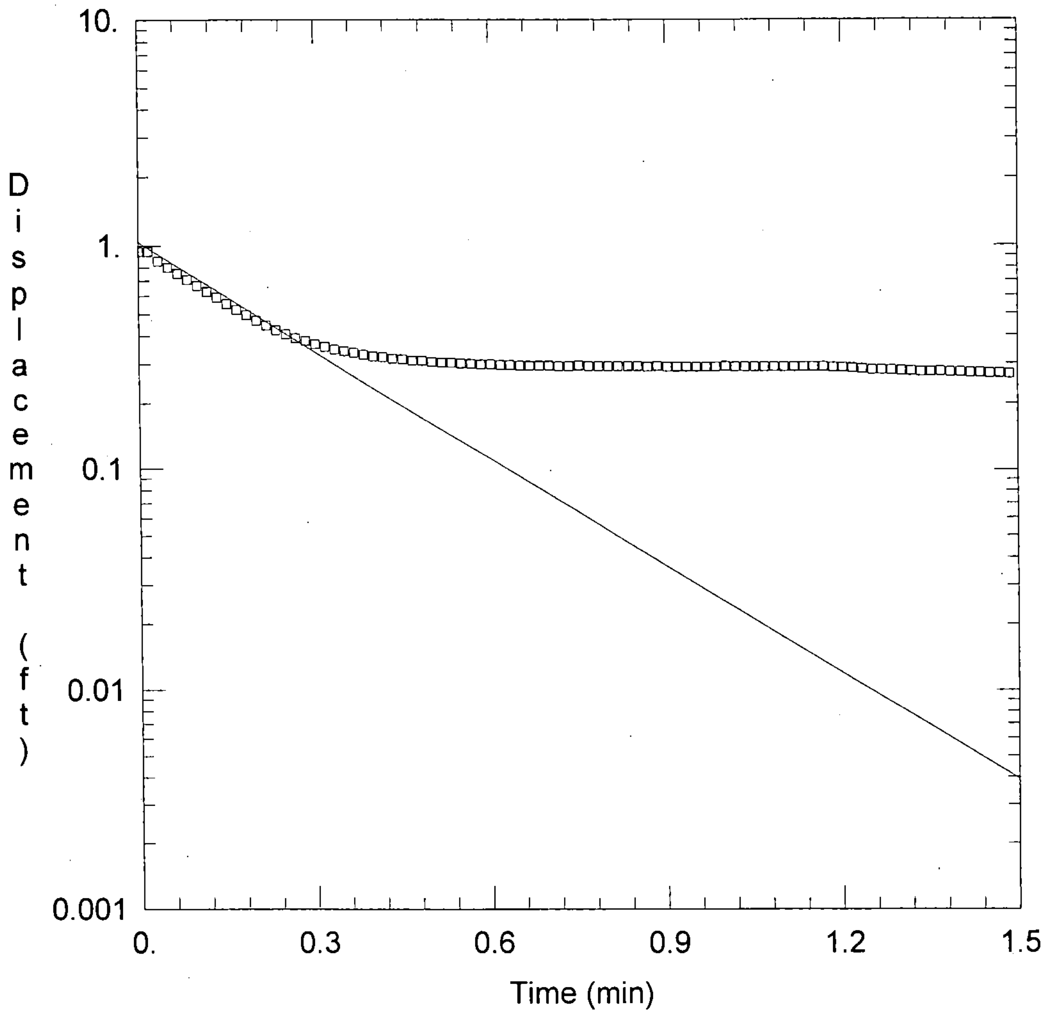
Saturated Thickness: 19.96 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Initial Displacement: 1.986 ft
Casing Radius: 0.08333 ft
Screen Length: 10. ft
Water Column Height: 15.68 ft
Wellbore Radius: 0.1958 ft
Gravel Pack Porosity: 0.25

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.003237 ft/min
y0 = 1.987 ft



WELL TEST ANALYSIS

Data Set: F:\PROJECT\HARDEE\09199033.07\BIENNIAL\SLUGTEST\MW-8A.AQT
Date: 06/26/03 Time: 08:51:12

PROJECT INFORMATION

Company: SCS
Client: Hardee County
Project: 09199033.07
Test Location: Hardee County
Test Well: MW-8A
Test Date: 06/02/03

AQUIFER DATA

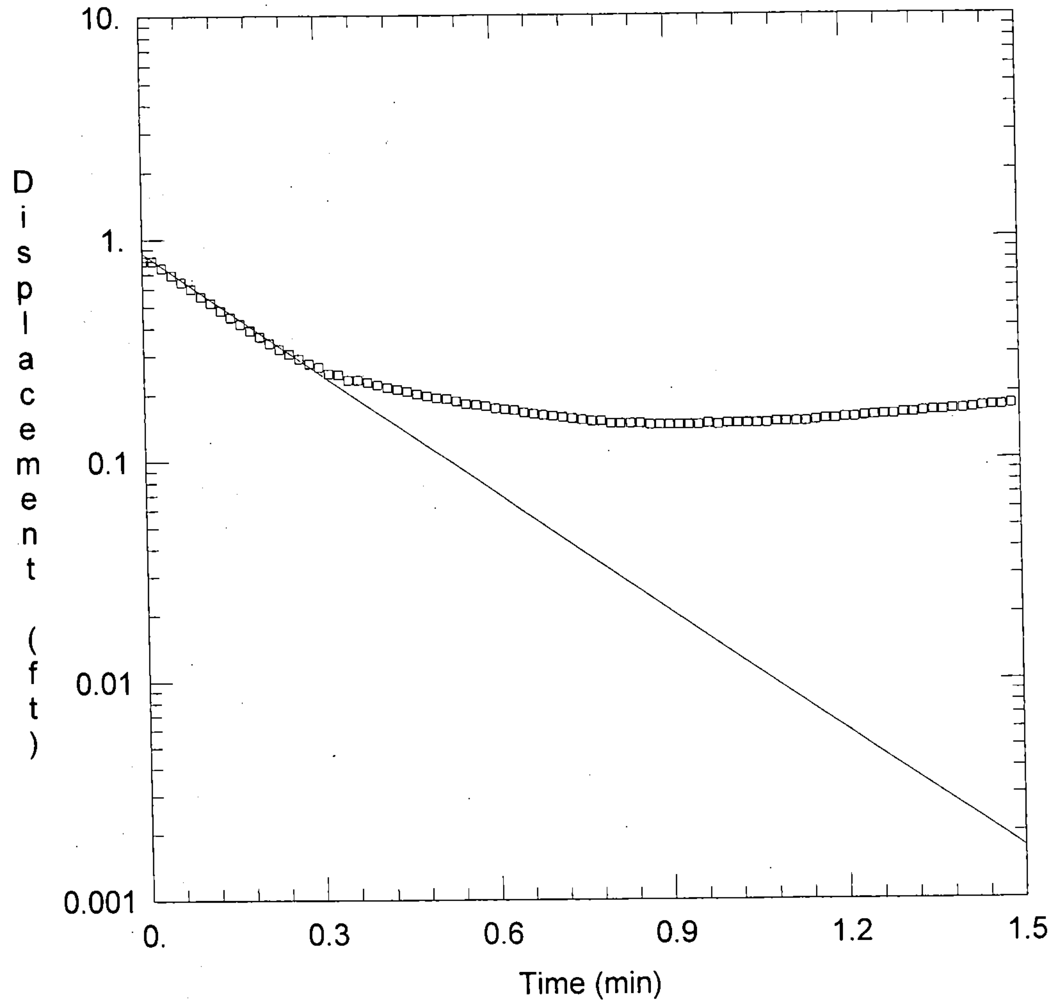
Saturated Thickness: 17.36 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Initial Displacement: 0.942 ft Water Column Height: 4.04 ft
Casing Radius: 0.08333 ft Wellbore Radius: 0.1958 ft
Screen Length: 10. ft Gravel Pack Porosity: 0.25

SOLUTION

Aquifer Model: Unconfined K = 0.005908 ft/min
Solution Method: Bouwer-Rice y0 = 1.037 ft



WELL TEST ANALYSIS

Data Set: F:\PROJECT\HARDEE\09199033.07\BIENNIAL\SLUGTEST\MW-8B.AQT
Date: 06/26/03 Time: 08:51:58

PROJECT INFORMATION

Company: SCS
Client: Hardee County
Project: 09199033.07
Test Location: Hardee County
Test Well: MW-8B
Test Date: 06/02/03

AQUIFER DATA

Saturated Thickness: 17.36 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Initial Displacement: 0.799 ft
Casing Radius: 0.08333 ft
Screen Length: 10. ft
Water Column Height: 4.04 ft
Wellbore Radius: 0.1958 ft
Gravel Pack Porosity: 0.25

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.006606 ft/min
y0 = 0.8692 ft

SCS ENGINEERS

SHEET ______ OF ______

CLIENT	PROJECT	JOB NO.
SUBJECT Har Lee	BY	DATE
	CHECKED	DATE

1. Saturated Thickness: Confining unit to Static Water Level
mw-8 ~~25.65~~ depth of confiner? 10.82 b
17.36 mw-4 - 19.96

2. hydraulic conductivity anisotropy ration (vertical to horizontal)
= 1

3 Length of well screen 10'

4 Depth of penetration for well screen: (Top of Water to Bottom of Screen)
Bottom 65.19 -4
mw-8 - 4.04
Bottom 72.30 -8
mw-4 - 15.68

*5. inside Radius of well casing = ✓

6. Wellbore radius = 8.25

7. effective porosity of Gravel Pack or sand pack '(0.2)?
unit
20/30 silica sand

8.

.08333 Casing
.1958 wellbore

ATTACHMENT I-4

JUNE 2003 SURFACE WATER DATA
HARDEE COUNTY LANDFILL

SHORT ENVIRONMENTAL LABORATORIES, INC.
10405 US 27 South
Sebring, Florida 33876
(800) 833-4022 FDOH# E85458, FDEP QAP# 880516 (863) 655-4022

For: Hardee County
Solid Waste Department
685 Airport Road
Wauchula, FL 33873-
Attn: J.R. Prestridge

08/20/2003
Page 1 of 5

Laboratory Number: 189135

Project: Hardee County
Location: Landfill
Sample ID: SW-1
Sampled By: E. McCarta on 06/13/2003 @ 1205
Received: 06/13/2003 @ 1330

REPORT OF ANALYSIS

FIELD DATA

Temperature	31.2	deg. C
pH	7.32	S.U.
Conductivity	249.	umho/cm
Dissolved Oxygen	2.40	mg/L
Turbidity	37.0	NTU
Color & Sheen	Color	

LABORATORY DATA

Parameter	Result	Units	Method	Analyst	Date/Time of Analysis	MDL
Biochemical Oxygen Demand	4.4	mg/L	EPA 405.1	D. Gillis	06/13/2003 @ 1600	2.
Chemical Oxygen Demand	21.	mg/L	HACH 8000	J. Cosgrave	06/16/2003 @ 0905	10.
Total Dissolved Solids	158.	mg/L	EPA 160.1	J. Virkler	06/18/2003 @ 0842	10.
Total Suspended Solids	37.	mg/L	EPA 160.2	J. Virkler	06/17/2003 @ 0838	1.
Fecal Coliform (MF)	> 600	#/100ml	SM 9222 D	T. Heath	06/13/2003 @ 1420	1
Total Hardness	120.	mg/L	EPA 130.2	K. Drury	07/07/2003 @ 0849	1.0
Ammonia Nitrogen (NH3-N)	0.10	mg/L	EPA 350.1	J. Cosgrave	06/17/2003 @ 0912	0.04
Un-Ionized Ammonia (N)	0.005u	mg/L	Calc.	B. Cummings	06/17/2003 @ 0912	0.005
Nitrite Nitrogen (NO2-N)	0.01u	mg/L	EPA 353.2	J. Cosgrave	06/13/2003 @ 1723	0.01
Nitrate Nitrogen (NO3-N)	0.02u	mg/L	Calc.	J. Cosgrave	06/18/2003 @ 1354	0.02
Nitrate + Nitrite N (NO2+NO3)	0.02u	mg/L	EPA 353.2	J. Cosgrave	06/18/2003 @ 1354	0.02

u = Parameter was analyzed for but not detected

Respectfully Submitted,

Bruce Cummings
Laboratory Director

SHORT ENVIRONMENTAL LABORATORIES, INC.
10405 US 27 South
Sebring, Florida 33876
(800) 833-4022 FDOH# E85450, FDEP QAP# 860516 (863) 655-4022

For: Hardee County
Solid Waste Department
685 Airport Road

08/20/2003

SHORT ENVIRONMENTAL LABORATORIES, INC.
10405 US 27 South
Sebring, Florida 33876
(800) 833-4022 FDOH# E85458, FDEP QAP# 880516 (863) 655-4022

For: Hardee County
Solid Waste Department
685 Airport Road
Wauchula, FL 33873-
Attn: J.R. Prestridge

08/20/2003
Page 3 of 5

Laboratory Number: 189135

Project: Hardee County
Location: Landfill
Sample ID: SW-1
Sampled By: E. McCarta on 06/13/2003 @ 1205
Received: 06/13/2003 @ 1330

REPORT OF ANALYSIS

LABORATORY DATA

Parameter	Result	Units	Method	Analyst	Date/Time of Analysis	MDL
Vanadium	0.10u	mg/L	EPA 6010	E84098	06/24/2003 @ 1012	0.10
Zinc	0.101	mg/L	EPA 289.1	J. Mansell	07/10/2003 @ 1136	0.002
Chlorophyll A	1.0u	mg/m3	SM 10200 H	E84100	06/25/2003 @ 0000	1.0
Acetone	2.5u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	2.5
Acrylonitrile	1.50u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	1.50
Benzene	0.04u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.04
Bromochloromethane	0.5u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.5
Bromodichloromethane	0.08u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.08
Tribromomethane	0.12u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.12
Carbon Disulfide	4.1u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	4.1
Carbon Tetrachloride	0.21u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.21
Chlorobenzene	0.04u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.04
Chloroethane	0.10u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.10
Trichloromethane	0.03u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.03
Dibromochloromethane	0.05u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.05
1,2-Dibromo-3-Chloropropane	0.5u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.5
1,2-Dibromoethane	0.5u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.5
1,2-Dichlorobenzene	0.03u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.03
1,4-Dichlorobenzene	0.03u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.03

u = Parameter was analyzed for but not detected

Respectfully Submitted,

Bruce Cummings
Laboratory Director

SHORT ENVIRONMENTAL LABORATORIES, INC.
10405 US 27 South
Sebring, Florida 33876
(800) 833-4022 FDOH# E85458, FDEP QAP# 880516 (863) 655-4022

For: Hardee County
Solid Waste Department
685 Airport Road
Wauchula, FL 33873-
Attn: J.R. Prestridge

08/20/2003

Laboratory Number: 189135

Project: Hardee County
Location: Landfill
Sample ID: SW-1
Sampled By: E. McCarta on 06/13/2003 @ 1205
Received: 06/13/2003 @ 1330

REPORT OF ANALYSIS

LABORATORY DATA

Parameter	Result	Units	Method	Analyst	Date/Time of Analysis	MDL
t-1,4-Dichloro-2-Butene	10.0u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	10.0
1,1-Dichloroethane	0.03u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.03
1,2-Dichloroethane	0.02u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.02
1,1-Dichloroethene	0.12u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.12
cis-1,2-Dichloroethene	0.10u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.10
trans-1,2-Dichloroethene	0.06u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.06
1,2-Dichloropropane	0.04u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.04
cis-1,3-Dichloropropene	0.05u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.05
trans-1,3-Dichloropropene	0.04u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.04
Ethylbenzene	0.06u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.06
2-Hexanone	5.0u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	5.0
Bromomethane	0.11u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.11
Chloromethane	0.13u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.13
Dibromomethane	0.3u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.3
Dichloromethane	0.03u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.03
2-Butanone	5.0u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	5.0
Iodomethane	0.5u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.5
4-Methyl-2-Pentanone	5.0u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	5.0
Styrene	1.0u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	1.0

u = Parameter was analyzed for but not detected

Respectfully Submitted,

Bruce Cummings
Laboratory Director

SHORT ENVIRONMENTAL LABORATORIES, INC.
10405 US 27 South
Sebring, Florida 33876
(800) 833-4022 FDOH# E85458, FDEP QAP# 880516 (863) 655-4022

08/20/2003

For: Hardee County
Solid Waste Department
685 Airport Road
Wauchula, FL 33873-
Attn: J.R. Prestridge

Laboratory Number: 189135

Project: Hardee County
Location: Landfill
Sample ID: SW-1
Sampled By: E. McCarta on 06/13/2003 @ 1205
Received: 06/13/2003 @ 1330

REPORT OF ANALYSIS

LABORATORY DATA

Parameter	Result	Units	Method	Analyst	Date/Time of Analysis	MDL
1,1,1,2-Tetrachloroethane	0.1u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.1
1,1,2,2-Tetrachloroethane	0.04u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.04
Tetrachloroethene	0.14u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.14
Toluene	0.11u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.11
1,1,1-Trichloroethane	0.04u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.04
1,1,2-Trichloroethane	0.10u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.10
Trichloroethene	0.19u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.19
Trichlorofluoromethane	0.08u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.08
1,2,3-Trichloropropane	0.3u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.3
Vinyl Acetate	10.0u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	10.0
Vinyl Chloride	0.17u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.17
Xylenes	0.11u	ug/L	EPA 8260	E84098	06/19/2003 @ 0000	0.11
Silver	0.07u	ug/L	EPA 272.2	D. Murto	06/29/2003 @ 1348	0.07

u = Parameter was analyzed for but not detected

Respectfully Submitted,

Bruce Cummings
Laboratory Director

PART III ANALYTICAL RESULTS

Facility GMS #: 4025C30001 Sampling Date/Time: 06/13/03 @ 1205

Test Site ID #: 4025A Report Period: 01/01/03 to 06/30/03

Site Name: SW-1 Well Purged (Y/N)

Classification of Groundwater Well Type: [ ] Background

[ ] Intermediate

[ ] Compliance

Groundwater Elevation (MSL): ft. [x] Other

STORET Code	Parameter Monitored	Sampling Method	Field Filtered Y/N	Analysis Method	Analysis Date/Time	Analysis Results/Units	Detection Limits/Units
000094	Specific Conductivity (field)	Direct	No	EPA 120.1	06/13/03 @ 1205	249. umhos/cm	1. umhos/cm
004050	pH (Field)	Direct	No	EPA 150.1	06/13/03 @ 1205	7.32 S.U.	NA
000299	Dissolved Oxygen (field)	Direct	No	EPA 360.1	06/13/03 @ 1205	2.40 mg/L	0.1 mg/L
082078	Turbidity (field)	Direct	No	EPA 180.1	06/13/03 @ 1205	37.0 NTU	0.1 NTU
000010	Temperature (field)	Direct	No	EPA 170.1	06/13/03 @ 1205	31.2 C	NA
085326	Colors & Sheens (by observation)	Direct	No	EPA	01/13/03 @ 1205	Color NA	NA
000310	Biochemical oxygen demand	Direct	No	EPA 405.1	06/13/03 @ 1600	4.4 mg/L	2. mg/L
000340	Chemical oxygen demand	Direct	No	Hach 8000	06/16/03 @ 1333	21. mg/L	10. mg/L
070300	Total dissolved solids	Direct	No	EPA 160.1	06/18/03 @ 1130	158. mg/L	10. mg/L
000530	Total suspended solids	Direct	No	EPA 160.2	06/17/03 @ 0838	37. mg/L	1. mg/L
031616	Fecal coliform	Direct	No	SM 9222D	06/13/03 @ 1420	> 600. #/100	1 #/100ml
000900	Total hardness as CaCO3	Direct	No	EPA 130.2	07/07/03 @ 0849	120. mg/L	1. mg/L
000610	Ammonia (NH3-N)	Direct	No	EPA 350.1	06/17/03 @ 0912	0.10 mg/L	0.04 mg/L
000053	Un-ionized Ammonia (N)	Direct	No	Calc.	06/17/03 @ 0912	< 0.005 mg/L	0.005 mg/L
000620	Nitrate (NO3-N)	Direct	No	EPA 353.2	06/18/03 @ 1354	< 0.02 mg/L	0.02 mg/L
000086	Total nitrogen	Direct	No	Calc.	06/18/03 @ 1354	0.82 mg/L	0.50 mg/L
000058	Total phosphorus (P)	Direct	No	EPA 365.2	06/26/03 @ 0853	1.35 mg/L	0.01 mg/L
000300	Total organic carbon	Direct	No	EPA 415.1	06/30/03 @ 1610	23.3 mg/L	0.1 mg/L
001097	Antimony	Direct	No	EPA 204.2	07/25/03 @ 1202	< 0.003 mg/L	0.003 mg/L
001002	Arsenic	Direct	No	EPA 206.3	07/08/03 @ 1127	< 0.005 mg/L	0.005 mg/L
001007	Barium	Direct	No	EPA 208.1	06/26/03 @ 1120	0.03 mg/L	0.02 mg/L
001012	Beryllium	Direct	No	EPA 210.2	07/22/03 @ 0922	< 0.001 mg/L	0.001 mg/L
001027	Cadmium	Direct	No	EPA 213.1	06/30/03 @ 1547	< 0.002 mg/L	0.002 mg/L
001034	Chromium	Direct	No	EPA 218.2	06/28/03 @ 1629	< 0.005 mg/L	0.005 mg/L
001037	Cobalt	Direct	No	EPA 6010	06/24/03 @ 1012	< 0.05 mg/L	0.05 mg/L
001042	Copper	Direct	No	EPA 220.1	06/23/03 @ 1516	< 0.01 mg/L	0.01 mg/L
001045	Iron	Direct	No	EPA 236.1	06/25/03 @ 0905	0.81 mg/L	0.02 mg/L
001051	Lead	Direct	No	EPA 239.2	06/26/03 @ 1408	0.003 mg/L	0.001 mg/L
071900	Mercury	Direct	No	EPA 245.1	07/03/03 @ 1223	< 0.001 mg/L	0.001 mg/L
001067	Nickel	Direct	No	EPA 249.1	07/01/03 @ 1219	0.01 mg/L	0.01 mg/L
001147	Selenium	Direct	No	EPA 270.2	06/30/03 @ 0835	< 0.005 mg/L	0.005 mg/L
001077	Silver	Direct	No	EPA 272.2	06/29/03 @ 1348	< 0.07 ug/L	0.07 ug/L
001059	Thallium	Direct	No	EPA 279.2	06/23/03 @ 1256	< 0.002 mg/L	0.002 mg/L
001087	Vanadium	Direct	No	EPA 6010	06/24/03 @ 1012	< 0.10 mg/L	0.1 mg/L
001092	Zinc	Direct	No	EPA 289.1	07/10/03 @ 1136	0.101 mg/L	0.002 mg/L
143125	Chlorophyll A	Direct	No	SM 10200 H	06/25/03 @ 0000	< 1.0 mg/m3	1. mg/m3

PART III ANALYTICAL RESULTS

Facility GMS #: 4025C30001 Sampling Date/Time: 06/13/03 @ 1205

Test Site ID #: 4025A Report Period: 01/01/03 to 06/30/03

Site Name: SW-1 Well Purged (Y/N)

Classification of Groundwater Well Type: [ ] Background
[ ] Intermediate
[ ] Compliance
[x] Other

Groundwater Elevation (MSL): ft.

STORET Code	Parameter Monitored	Sampling Method	Field Filtered Y/N	Analysis Method	Analysis Date/Time	Analysis Results/Units	Detection Limits/Units
081552	Acetone	Direct	No	EPA 8260	06/19/03	< 2.5 ug/L	2.5 ug/L
034215	Acrylonitrile	Direct	No	EPA 8260	06/19/03	< 1.5 ug/L	1.5 ug/L
034030	Benzene	Direct	No	EPA 8260	06/19/03	< 0.04 ug/L	0.04 ug/L
073085	Bromochloromethane	Direct	No	EPA 8260	06/19/03	< 0.5 ug/L	0.5 ug/L
032101	Bromodichloromethane	Direct	No	EPA 8260	06/19/03	< 0.08 ug/L	0.08 ug/L
032104	Bromoform	Direct	No	EPA 8260	06/19/03	< 0.12 ug/L	0.12 ug/L
046372	Carbon disulfide	Direct	No	EPA 8260	06/19/03	< 4.1 ug/L	4.1 ug/L
032102	Carbon tetrachloride	Direct	No	EPA 8260	06/19/03	< 0.21 ug/L	0.21 ug/L
034301	Chlorobenzene	Direct	No	EPA 8260	06/19/03	< 0.04 ug/L	0.04 ug/L
034311	Chloroethane	Direct	No	EPA 8260	06/19/03	< 0.10 ug/L	0.10 ug/L
032106	Chloroform	Direct	No	EPA 8260	06/19/03	< 0.03 ug/L	0.03 ug/L
032105	Dibromochloromethane	Direct	No	EPA 8260	06/19/03	< 0.05 ug/L	0.05 ug/L
7860	1,2-Dibromo-3-chloropropane (DBCP)	Direct	No	EPA 8260	06/19/03	< 0.50 ug/L	0.50 ug/L
046369	1,2-Dibromoethane	Direct	No	EPA 8260	06/19/03	< 0.50 ug/L	0.50 ug/L
034536	o-Dichlorobenzene	Direct	No	EPA 8260	06/19/03	< 0.03 ug/L	0.03 ug/L
034571	p-Dichlorobenzene	Direct	No	EPA 8260	06/19/03	< 0.03 ug/L	0.03 ug/L
077268	trans-1,4-Dichloro-2-butene	Direct	No	EPA 8260	06/19/03	< 10. ug/L	10. ug/L
034496	1,1-Dichloroethane	Direct	No	EPA 8260	06/19/03	< 0.03 ug/L	0.03 ug/L
034531	1,2-Dichloroethane	Direct	No	EPA 8260	06/19/03	< 0.02 ug/L	0.02 ug/L
034501	1,1-Dichloroethylene	Direct	No	EPA 8260	06/19/03	< 0.12 ug/L	0.12 ug/L
077093	cis-1,2-Dichloroethylene	Direct	No	EPA 8260	06/19/03	< 0.10 ug/L	0.10 ug/L
034546	trans-1,2-Dichloroethylene	Direct	No	EPA 8260	06/19/03	< 0.06 ug/L	0.06 ug/L
034541	1,2-Dichloropropane	Direct	No	EPA 8260	06/19/03	< 0.04 ug/L	0.04 ug/L
034704	cis-1,3-Dichloropropene	Direct	No	EPA 8260	06/19/03	< 0.05 ug/L	0.05 ug/L
034699	trans-1,3-Dichloropropene	Direct	No	EPA 8260	06/19/03	< 0.04 ug/L	0.04 ug/L
034371	Ethylbenzene	Direct	No	EPA 8260	06/19/03	< 0.06 ug/L	0.06 ug/L
077103	2-Hexanone	Direct	No	EPA 8260	06/19/03	< 5.0 ug/L	5.0 ug/L
034413	Methyl bromide	Direct	No	EPA 8260	06/19/03	< 0.11 ug/L	0.11 ug/L
034418	Methyl chloride	Direct	No	EPA 8260	06/19/03	< 0.13 ug/L	0.13 ug/L
046351	Methylene bromide	Direct	No	EPA 8260	06/19/03	< 0.30 ug/L	0.30 ug/L
034423	Methylene chloride	Direct	No	EPA 8260	06/19/03	< 0.03 ug/L	0.03 ug/L
081595	Methyl ethyl ketone	Direct	No	EPA 8260	06/19/03	< 5.0 ug/L	5.0 ug/L

PART III ANALYTICAL RESULTS

Facility GMS #: 4025C30001

Sampling Date/Time: 06/13/03 @ 1205

Test Site ID #: 4025A

Report Period: 01/01/03 to 06/30/03

Well Name: SW-1

Well Purged (Y/N)

Classification of Groundwater

Well Type: [ ] Background
[ ] Intermediate
[ ] Compliance
[x] Other

Groundwater Elevation (MSL): ft.

STORET Code	Parameter Monitored	Sampling Method	Field Filtered Y/N	Analysis Method	Analysis Date/Time	Analysis Results/Units	Detection Limits/Units
077424	Methyl iodide	Direct	No	EPA 8260	06/19/03	< 0.50 ug/L	0.50 ug/L
078133	4-Methyl-2-pentanone	Direct	No	EPA 8260	06/19/03	< 5.0 ug/L	5.0 ug/L
077128	Styrene	Direct	No	EPA 8260	06/19/03	< 1.0 ug/L	1.0 ug/L
077562	1,1,1,2-Tetrachloroethane	Direct	No	EPA 8260	06/19/03	< 0.10 ug/L	0.10 ug/L
034516	1,1,2,2-Tetrachloroethane	Direct	No	EPA 8260	06/19/03	< 0.04 ug/L	0.04 ug/L
034475	Tetrachloroethylene	Direct	No	EPA 8260	06/19/03	< 0.14 ug/L	0.14 ug/L
034010	Toluene	Direct	No	EPA 8260	06/19/03	< 0.11 ug/L	0.11 ug/L
034506	1,1,1-Trichloroethane	Direct	No	EPA 8260	06/19/03	< 0.04 ug/L	0.04 ug/L
034511	1,1,2-Trichloroethane	Direct	No	EPA 8260	06/19/03	< 0.10 ug/L	0.10 ug/L
039180	Trichloroethylene	Direct	No	EPA 8260	06/19/03	< 0.19 ug/L	0.19 ug/L
034488	Trichlorofluoromethane	Direct	No	EPA 8260	06/19/03	< 0.08 ug/L	0.08 ug/L
077443	1,2,3-Trichloropropane	Direct	No	EPA 8260	06/19/03	< 0.30 ug/L	0.30 ug/L
077057	Vinyl acetate	Direct	No	EPA 8260	06/19/03	< 10. ug/L	10. ug/L
039175	Vinyl chloride	Direct	No	EPA 8260	06/19/03	< 0.17 ug/L	0.17 ug/L
034020	Xylenes	Direct	No	EPA 8260	06/19/03	< 0.11 ug/L	0.11 ug/L

ATTACHMENT I-5

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL INVENTORY

SOUTHWEST FLORIDA WATER MANAGEMENT .STRICT RDBS CODE TABLE DISCRIPTIONS

WELL USE CODES

CODE	DESCRIPTION
A	AGRICULTURE
AL	AQUIFER WATER LEVELS
AQ	AQUICULTURE
AS	AQUIF. AND STORAGE RECOV.
AU	AUGMENTATION
B	PUBLIC SUPPLY
C	DEWATERING
CN	PUBLIC SUPPLY CONV. (TOP 20)
CV	PUBLIC SUPPLY CONV./ RECLASS
D	DOMESTIC
DF	DISCHARGE FLOW
E	ESSENTIAL SERVICES (FIRE PRO.)
EF	EFFLUENT WASTEWATER
F	FOUND. TEST WELL (SOIL BOR.)
G	RECHARGE/ SATELITE
GR	GROUNDING ROD
GT	GEOTHERMAL WELL
H	REPAIR OR DEEPEN
HA	REPAIR OR IRRIGATION
T	TESTWELL / PIEZOMETER
U	RECOVERY
V	INVENTORY WELL
W	AIR COND. SUPPLY - HEAT PUMP
WL	WETLAND WATER LEVEL
WQ	WATER QUALITY, GENERAL
Y	PLUGGED
YY	DISMANTLED
Z	SEALING WATER
ZZ	CONVERSION USE CODE ERROR

WELL USE CODES (CONT'D)

HB	REPAIR PUBLIC SUPPLY
HD	REPAIR DOMESTIC
HY	BACK PLUGGING
I	INDUSTRIAL
J	INJECTION WELL
K	CONNECTION WELLS
L	LIVESTOCK
LL	LAKE WATER LEVEL
M	MINING
N	RETURN AIR/ HEAT
O	OBSERVATION OR MONITOR WELL
P	POWER
PC	PUBLIC SUPPLY CONV. (NO REC.)
Q	DRAINAGE WELL
R	RECREATIONAL
RC	RECHARGE
RF	RAINFALL
RP	REPUMP
RU	REUSE
SF	STREAMFLOW
SR	REPLACEMENT WELL (SARASOTA)
SW	SALINE WATER INTRUSION

SWFWMD WELL INVENTORY

WCP No.	Well No.	Issued	Completed	Section	Township	Range	Diameter	Well Use Code	Owner's Name	Owner's Address	Owner's City	Owner's State	Owner's Zip	Well Location	Reference No.	Well Depth	Casing Mat'l	Case Depth	Latitude	Longitude	Pump (gpm)
318473	1	1/1/70	7/1/79	3	34	25	4	A	J BLACKWELD	NO ADDRESS	NO CITY	FL			73131150	33	Z	14			
319995	1	1/1/70	7/1/79	1	34	25	4	D	J JUSTISS	NO ADDRESS	NO CITY	FL			74020120	205	Z	60			
323193	1	1/1/70	7/1/79	1	34	25	4	D	HELENA CHEMICAL COMPANY	2486 E MAIN ST	WAUCHULA	FL	33873		74098720	150	Z	42			
324457	1	1/1/70	7/1/79	1	34	25	4	D	D STATON	NO ADDRESS	NO CITY	FL			74127550	165	Z	42			
329899	1	1/1/70	7/1/79	1	34	25	4	D	J L KNIGHT	NO ADDRESS	NO CITY	FL			76016350	135	Z	56			
332296	1	1/1/70	7/1/79	1	34	25	4	A	B MATNEY	NO ADDRESS	NO CITY	FL			76069090	202	Z	61			
333062	1	1/1/70	7/1/79	1	34	25	6	A	SHACKLEFORD	NO ADDRESS	NO CITY	FL			76085770	444	Z	59			
333164	1	1/1/70	7/1/79	3	34	25	4	A	M GILLIARD	NO ADDRESS	NO CITY	FL			77088070	202	Z	60			
338813	1	1/1/70	7/1/79	1	34	25	4	D	G WHEELER	NO ADDRESS	NO CITY	FL			78048140	157	Z	45			
339327	1	1/1/70	7/1/79	1	34	25	4	D	WAITE,G	NO ADDRESS	NO CITY	FL			78057570	196	Z	46			
340767	1	1/1/70	1/6/79	3	34	25	4	D	VICTOR KIDDER	OLD AVON PARK RD(NEW YORK	WAUCHULA	FL	33873		79000870	137	Z	42			
341290	1	1/1/70	7/1/79	2	34	25	4	D	TUCKER,J F	NO ADDRESS	NO CITY	FL			79007110	240	Z	51			
352508	1	3/25/80	8/15/80	2	34	25	4	D	J W CREWS JR	INGLIS WAY	WAUCHULA	FL	33873			204	Z	80			
366542	1	6/19/81	7/9/81	1	34	25	4	D	HAYES, DOUG	HWY 64-A EAST	WAUCHULA	FL	33873			180	Z	63			
370224	1	11/12/81	12/19/81	2	34	25	4	B	MOOSE LODGE	PO BOX 191 HWY 64 A	WAUCHULA	FL	33873			205	Z	78			
371352	1	1/6/82	4/2/82	2	34	25	4	D	SHACKELFORD, TERRY C.	46 SHACKLEFORD RD	WAUCHULA	FL	33873			255	Z	88			
380023	1	2/24/83	11/30/83	3	34	25	4	A	DEASE, R. J.	US 17 & 35	ZOLFO SPRINGS	FL	33890			370	Z	55			
382360	1	5/24/83	8/3/83	3	34	25	2	D	KOZDEMBA, STANLEY	RT 2, BOX 422	WAUCHULA	FL	33873			187	Z	65			
389056	1	2/8/84	5/26/84	1	34	25	4	B	CHURCH OF LATTER DAY SAINTS	4823 N ROYAL ATLANTA DR	TUCKER	GA	30084			159	Z	57			
397334	1	10/16/84	2/28/85	1	34	25	4	D	DEASE, R J	302 DIANA AVE	WAUCHULA	FL	33873			156	Z	56			
398282	1	11/19/84	1/4/85	1	34	25	4	A	GRACE, KENNETH	214 51ST AVE	WAUCHULA	FL	33873			235	Z	70			
398670	1	12/3/84	1/14/85	3	34	25	4	A	MONIES, IVALEAH	307 EAST MAIN STREET	WAUCHULA	FL	33873			250	Z	84			
401320	1	3/4/85	8/16/85	1	34	25	4	A	CHURCH, L D S	S R 636	WAUCHULA	FL	33873			230	C	105			
403521	1	4/26/85	6/26/85	2	34	25	4	D	BASS, ROGER	RT 1 PINE PARK DRIVE	WAUCHULA	FL	33873			220	Z	74			
408520	1	9/26/85	1/6/86	1	34	25	4	D	TERRY SHACKELFORD	ROUTE 3, BOX 46	WAUCHULA	FL	33873			220	Z	76			
418477	1	7/23/86	8/20/86	1	34	25	6	A	KEITH CONLEY	RT 2 BOX 171-C	WAUCHULA	FL	33873			895	A	336	273310	814540.3	
425156	1	12/11/86	12/15/86	3	34	25	2	O	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			15	B	5			
425157	1	12/11/86	12/15/86	3	34	25	2	O	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			15	B	5			
425158	1	12/11/86	12/15/86	3	34	25	2	O	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			15	B	5			
425159	1	12/11/86	12/15/86	3	34	25	2	O	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			15	B	5			
425164	1	12/11/86	12/16/86	3	34	25	2	O	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			12	B	2			
425165	1	12/11/86	12/16/86	3	34	25	2	O	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			12	B	2			
425166	1	12/11/86	12/16/86	3	34	25	2	O	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			12	B	2			
425167	1	12/11/86	12/16/86	3	34	25	2	O	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			12	B	2			
432983	1	6/2/87	6/8/87	3	34	25	4	A	WAUCHULA POST OFFICE	EAST MAIN STREET	WAUCHULA	FL	33873			360	A	105			
460396	1	6/17/88	6/6/89	2	34	25	4	D	BAGWELL, THOMAS & LOIS	97 LAKE DAMON DRIVE	AVON PARK	FL	33826			225	A	105			
463803	1	7/13/88	6/6/89	2	34	25	6	A	CANTU, STEPHEN	P O BOX 1795	WAUCHULA	FL	33873			225	A	126			
474122	1	1/11/89	2/22/89	3	34	25	2	O	HENDERSON'S EXXON	201 N. 6TH AVENUE	WAUCHULA	FL	33873			15	B	15			
474124	1	1/11/89	2/22/89	3	34	25	2	O	HENDERSON'S EXXON	201 N. 6TH AVENUE	WAUCHULA	FL	33873			15	B	15			
474125	1	1/11/89	2/22/89	3	34	25	2	Y	HENDERSON'S EXXON	201 N. 6TH AVENUE	WAUCHULA	FL	33873			15	B	15			
474126	1	1/11/89	2/22/89	3	34	25	2	O	HENDERSON'S EXXON	201 N. 6TH AVENUE	WAUCHULA	FL	33873			15	B	15			
476026	1	2/21/89	3/20/89	1	34	25	4	A	JACK D SOLES	PO BOX 1264-210 N 3RD AVE	WAUCHULA	FL	33873			250	A	51			
479509	1	5/1/89	11/3/89	2	34	25	4	D	B.G. METHODIST CHURCH	310 N. GRAPE STREET	WAUCHULA	FL	33873			235	B	54			
479510	1	5/1/89	10/1/89	2	34	25	4	A	WEBB, ETHEL	RT.3, SHACKELFORD ROAD	WAUCHULA	FL	33873			200	B	63			
482556	1	6/26/89	6/28/89	3	34	25	2	O	SLAUGHTER MOTOR SALES	HWY 64A & HWY 17	WAUCHULA	FL	33873			10	B	10			
483314	1	7/12/89	7/27/89	1	34	25	4	D	CLIFFORD BRINSON	PO BOX 178	HAMPTON	FL	32044			211	A	98			
485167	1	8/22/89	8/27/89	3	34	25	4	A	GORDON, LEON J.& RUTH H.	P.O. BOX 204	WAUCHULA	FL	33873			55	A	41			
487382	1	10/10/89	12/2/89	1	34	25	4	D	WATSON, JUDITH	RT.2 BOX 179C	WAUCHULA	FL	33873			273	B	77			
488023	1	10/20/89	2/8/90	1	34	25	5	A	MONEY, LEE DANIEL	P.O. BOX 332	ZOLFO SPRINGS	FL	33880			335	B	100			
488979	1	11/9/89	2/8/90	1	34	25	4	D	MONEY, LEE DANIEL	P.O. BOX 332	ZOLFO SPRINGS	FL	33890			255	B	78			
489200	1	11/14/89	1/30/90	3	34	25	10	H	CITY OF WAUCHULA	PO BOX 818	WAUCHULA	FL	33873-0818			400	B	400	273253	814807.3	
511969	1	3/22/91	4/2/91	1	34	25	4	A	HELENA CHEMICAL CORPORATION	2405 NORTH 71ST STREET	TAMPA	FL	33607			270	A	67			
513034	1	4/29/91	5/5/91	3	34	25	4	D	W MORAN	211 SOUTH 2ND AVE	WAUCHULA	FL	33873			198	B	75			
515084	1	7/10/91	7/18/91	3	34	25	2	O	QUALITY PETROLEUM CORP	PO BOX 3889-1625 GEORGE JENK	LAKELAND	FL	33802-3889			14	B	2			
515084	2	7/10/91	7/18/91	3	34	25	2	O	QUALITY PETROLEUM CORP	PO BOX 3889-1625 GEORGE JENK	LAKELAND	FL	33802-3889			14	B	2			
515084	3	7/10/91	7/18/91	3	34	25	2	O	QUALITY PETROLEUM CORP	PO BOX 3889-1625 GEORGE JENK	LAKELAND	FL	33802-3889			14	B	2			
515084	4	7/10/91	7/18/91	3	34	25	2	O	QUALITY PETROLEUM CORP	PO BOX 3889-1625 GEORGE JENK	LAKELAND	FL	33802-3889			14	B	2			
522191	1	2/25/92	3/6/92	2	34	25	5	D	BAGWELL, THOMAS & LOIS	97 LAKE DAMON DRIVE	AVON PARK	FL	33826			183	B	120			

* Shaded cells with astericks refer to the SWFWMD permits located within this attachment.

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SWFWMD WELL INVENTORY

WCP No.	Well No.	Issued	Completed	Section	Township	Range	Diameter	Well Use Code	Owner's Name	Owner's Address	Owner's City	Owner's State	Owner's Zip	Well Location	Reference No.	Well Depth	Casing Mat'l	Case Depth	Latitude	Longitude	Pump (gpm)
326458	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			75042600*	185	Z	55			
326459	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			75042620*	180	Z	57			
326460	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			750426509*	132	Z	63			
326489	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			75043380*	145	Z	57			
326490	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			75043390*	160	Z	60			
326491	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			75043400*	175	Z	55			
326594	1	1/1/70	7/1/79	36	33	25	4	D	R GIFFIARD	NO ADDRESS	NO CITY	FL			75045830*	175	Z	56			
326595	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			75045840*	180	Z	53			
326596	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			75045860*	185	Z	68			
328565	1	1/1/70	7/1/79	36	33	25	4	D	W SMITH	NO ADDRESS	NO CITY	FL			75089260*	205	Z	50			
329744	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			76013130	175	Z	57			
335994	1	1/1/70	7/1/79	36	33	25	4	A	DOUGIAS D	NO ADDRESS	NO CITY	FL			77149070	240	Z	60			
361828	1	2/6/81	4/20/81	36	33	25	4	D	ROSENBERGER, SAM	DANSBY RD	WAUCHULA	FL	33873			208	Z	52			
361829	1	2/6/81	4/28/81	36	33	25	4	D	ROSENBERGER, SAM	DANSBY RD	WAUCHULA	FL	33873			204	Z	53			
366380	1	6/11/81	7/12/81	36	33	25	4	D	HINES, HOWARD	RT 2 LOT 09	WAUCHULA	FL	33873			210	Z	52			
377003	1	9/17/82	11/2/82	36	33	25	4	D	PARKER, J. B.	RT 1, BOX 200	BOWLING GREEN	FL	33834			200	Z	63			
384054	1	7/18/83	10/4/83	35	33	25	4	O	HARDEE COUNTY REGIONAL SANITARY	AIRPORT RD	WAUCHULA	FL	33873			15	Z	12			
384055	1	7/19/83	10/1/83	35	33	25	4	O	HARDEE COUNTY REGIONAL SANITARY	AIRPORT RD	WAUCHULA	FL	33873			11	Z	8			
384056	1	7/18/83	10/11/83	35	33	25	4	O	HARDEE COUNTY REGIONAL SANITARY	AIRPORT RD	WAUCHULA	FL	33873			11	Z	8			
384468	1	8/5/83	10/20/83	35	33	25	4	I	HARDEE COUNTY REGIONAL SANITARY	AIRPORT RD	WAUCHULA	FL	33873			200	Z	54			
408523*	1	9/26/85	7/31/86	36	33	25	4	D	DRAKE, GEORGE W	BOX 1182	WAUCHULA	FL	33873			180	A	84			
414023	1	4/1/86	8/20/86	36	33	25	4	D	DRAKE, GEORGE	1342 HWY S 17	WAUCHULA	FL	33873			220	B	70			
418987	1	7/30/86	1/7/87	36	33	25	4	D	BURNETT, HENRY P	RT 2	WAUCHULA	FL	33873			235	A	107			
435610	1	7/27/87	8/3/87	35	33	25	2	O	HARDEE COUNTY REGIONAL SANITARY	AIRPORT RD	WAUCHULA	FL	33873			20	B	10			
435611	1	7/27/87	8/3/87	35	33	25	2	O	HARDEE COUNTY REGIONAL SANITARY	AIRPORT RD	WAUCHULA	FL	33873			18	B	8			
435612	1	7/27/87	8/4/87	35	33	25	2	O	HARDEE COUNTY REGIONAL SANITARY	AIRPORT RD	WAUCHULA	FL	33873			21	B	11			
435613	1	7/27/87	8/4/87	35	33	25	2	O	HARDEE COUNTY REGIONAL SANITARY	AIRPORT RD	WAUCHULA	FL	33873			21	B	11			
510327	1	2/7/91	4/10/91	35	33	25	4	B	HARDEE COUNTY REGIONAL SANITARY	AIRPORT RD	WAUCHULA	FL	33873			197	A	63			
545871	1	12/7/93	12/10/93	36	33	25	4	D	MANUEL HERRERA	126 CYPRESS ST.	WACHULA	FL	33873			203	A	84			
553344	1	6/2/94	5/8/95	36	33	25	5	D	LEO DAVIS	SUMMER RD	WAUCHULA	FL	33873			175	B	60			
554873	1	7/5/94	7/5/94	36	33	25	2	O	HARDEE COUNTY SOLID WASTE	685 AIRPORT RD	WAUCHULA	FL	33873			15	B	10			
554873	2	7/5/94	7/5/94	36	33	25	2	O	HARDEE COUNTY SOLID WASTE	685 AIRPORT RD	WAUCHULA	FL	33873			15	B	10			
554873	3	7/5/94	7/5/94	36	33	25	2	O	HARDEE COUNTY SOLID WASTE	685 AIRPORT RD	WAUCHULA	FL	33873			15	B	10			
554873	4	7/5/94	7/5/94	36	33	25	2	O	HARDEE COUNTY SOLID WASTE	685 AIRPORT RD	WAUCHULA	FL	33873			15	B	10			
579220	1	5/8/96	5/20/96	34	33	25	4	D	DENTON CASH	RT 2 BOX 21	WAUCHULA	FL	33863	HWY 664A		200	B	80			
579599	1	5/17/96	6/6/96	36	33	25	4	D	PHILLIP WAYNE FARRER	CR 664B	WAUCHULA	FL	33873	CR 664B		205	A	58			22
579861	1	5/23/96	5/30/96	34	33	25	4	D	DENTON CASH	RT 2 BOX 21	WAUCHULA	FL	33863	HERD BRIDGE ROAD		200	B	80			
586779	1	12/31/96	1/8/97	35	33	25	4	A	GENE FIELD	575 AIRPORT RD	WAUCHULA	FL	33873	515 AIRPORT RD		173	A	49			50
597100	1	9/10/97	10/1/97	36	33	25	4	D	SANDRA V. HUMPHRIES	7741 FARR RD	ONA	FL	33865	7741 FARR RD(SUMMER ROA		200	Z	115			
600529*	1	12/15/97	2/13/98	36	33	25	5	D	PAUL DUMONT &	POST OFFICE BOX 2581	WAUCHULA	FL	33873	565 BOYD COWART ROAD		200	B	60			
608876	1	8/5/98	10/8/98	36	33	25	2	A	SANDRA V. HUMPHRIES	7741 FARR ROAD	ONA	FL	33865	7741 FAIR RD		40	C	21			
614259	1	1/7/99	2/10/99	36	33	25	4	A	JAMES SLAYTON	6848 CIRCLE CREEK DRIVE	PINELLAS PARK	FL	33781	SUMMER RD.		277	B	70			
622889	1	7/12/99	7/12/99	36	33	25	4	D	BILL HODGE	754 SUMNER RD	WAUCHULA	FL	33890	754 SUMMER ROAD		220	C	84			
627535	1	11/4/99	11/4/99	35	33	25	5	Y	HARDEE COUNTY SOLID WASTE	685 AIRPORT RD	WAUCHULA	FL	33873	685 AIRPORT RD		10	Z	10			
631797	1	2/21/00	2/23/00	36	33	25	5	D	JOYCE LYERLY	1028 SUMNER RD	WAUCHULA	FL	33873	1028 SUMNER ROAD		157	Z	118			
637035	1	6/1/00	6/8/00	36	33	25	4	D	JACK KERNS	918 SUMMER RD	WAUCHULA	FL	33873	918 SUMMER ROAD		200	C	84			
639295	1	7/13/00	7/19/00	36	33	25	4	D	STEVE ZALEWSKI	CREWS RD	WAUCHULA	FL	33873	2404 GREENLEAF RD		260	C	84			
643154	1	10/12/00	12/22/00	36	33	25	4	D	BOBBY AND ESTER BRAGG	671 SUMNER RD	WAUCHULA	FL	33873	671 SUMNER RD		160	B	76			25
647646	1	1/29/01	1/31/01	36	33	25	4	D	GREGORY MORGAN	2598 GREGORY LN	WAUCHULA	FL	33823	2598 GREGORY LN		280	B	95			15
651055	1	4/6/01	4/17/01	36	33	25	4	D	MARY BARTLEY	1181 FINBAR WAY	WAUCHULA	FL	33873	1181 FINBAR WAY		145	B	110	273419	814554.03	
651056	1	4/6/01	4/19/01	36	33	25	4	D	CARLOS AVILES	510 CYPRESS ST	WAUCHULA	FL	33873	510 CYPRESS ST/BLK I		150	B	110	273342.1	814552.07	
651057	1	4/6/01	4/20/01	36	33	25	4	D	RONNIE BARTLEY	470 CYPRESS ST	WAUCHULA	FL	33873	470 CYPRESS ST		150	B	110	273339	814553	
656331	1	7/18/01	8/28/01	36	33	25	4	D	LARRY FIEGLE	555 SUMMER RD	WAUCHULA	FL	33873	555 SUMMER RD		170	B	118			
659635	1	10/8/01	10/23/01	36	33	25	4	D	CARL & MARYJANE SISSOMS	3998 E MAIN ST	WAUCHULA	FL	33873	498 AIRPORT RD		200	C	84	273343.1	814629.07	
670100	1	5/30/02	6/8/02	36	33	25	4	D	HAROLD LAMBERT	715 BOYD COWART RD	WAUCHULA	FL	33873	715 BOYD COWART RD		270	C	63			
673367	1	8/7/02	8/10/02	36	33	25	4	A	NICK MIRINDA	510 AIRPORT RD	WACHULA	FL	33873	510 AIRPORT RD		200	C	84			
680590*	1	2/7/03		36	33	25	12	A	CHARLES E & GAIL D BEST	PO BOX 203	WAUCHULA	FL	33873	NEAR SR 664B & SUMNER RD			A		273416.5	814544.08	
682600	1	3/26/03		36	33	25	4	Y	MARCELINO BALDERAS	565 CYPRESS ST	WACHULA	FL	33873	565 CYPRESS STREET			A				
682601	1	3/26/03		36	33	25	4	D	MARCELINO BALDERAS	565 CYPRESS ST	WACHULA	FL	33873	565 CYPRESS STREET			C				
311120	1	1/1/70	7/1/79	1	34	25	4	D	CANNON BLDG	NO ADDRESS	NO CITY	FL			72067190	51	Z	21			
311403	1	1/1/70	7/1/79	1	34	25	4	D	CANNON BLDG	NO ADDRESS	NO CITY	FL			72074580	198	Z	37			
311404	1	1/1/70	7/1/79	1	34	25	4	D	CANNON BLDG	NO ADDRESS	NO CITY	FL			72074590	171	Z	39			
312203	1	1/1/70	7/1/79	3	34	25	4	A	K MITCHELL	NO ADDRESS	NO CITY	FL			72094540	232	Z	63			
312962	1	1/1/70	7/1/79	1	34	25	4	D	J A PULLEN	NO ADDRESS	NO CITY	FL			72114200	159	Z	61			

* Shaded cells with astericks refer to the SWFWMD permits located within this attachment.

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SWFWMD WELL INVENTORY

WCP No.	Well No.	Issued	Completed	Section	Township	Range	Diameter	Well Use Code	Owner's Name	Owner's Address	Owner's City	Owner's State	Owner's Zip	Well Location	Reference No.	Well Depth	Casing Mat'l	Case Depth	Latitude	Longitude	Pump (gpm)
309778	1	1/1/70	7/1/79	25	33	25	4	A	NO NAME	NO ADDRESS	NO CITY	FL			72002880	45	Z	20			
318121	1	1/1/70	7/1/79	25	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			73122540	170	Z	42			
318122	1	1/1/70	7/1/79	25	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			73122550	170	Z	42			
318898	1	1/1/70	7/1/79	23	33	25	4	D	MOORE, JOHNNIE L.	P.O.BOX 1202	WACHULA	FL	33873		73140530	144	Z	36			
323891	1	1/1/70	7/1/79	26	33	25	4	D	L ROBERTS	NO ADDRESS	NO CITY	FL			74115250	124	Z	51			
326042	1	1/1/70	7/1/79	23	33	25	6	A	EWELL SWEET	NO ADDRESS	NO CITY	FL			75032480	210	Z	121			
326323	1	1/6/75	7/1/79	23	33	25	4	D	LYKES, LUTHER	RO.2 BOX 60	WACHULA	FL	33873		75039540	168	Z	108			
328857	1	9/8/75	7/1/79	24	33	25	4	D	STAMEY, LEONARD C.	P.O.BOX 1389	WACHULA	FL	33873		75095440	191	Z	84			
330631	1	1/1/70	7/1/79	26	33	25	4	D	K CONLEY	NO ADDRESS	NO CITY	FL			76033330	138	Z	72			
331249	1	1/1/70	7/1/79	23	33	25	4	D	F F WINFREE	NO ADDRESS	NO CITY	FL			76046620	150	Z	112			
331735	1	1/1/70	7/1/79	26	33	25	4	D	H D WILLIS	NO ADDRESS	NO CITY	FL			76056750	42	Z	18			
333188	1	1/13/77	7/1/79	23	33	25	4	D	MALCOLM ADAMS	RT 2 BOX 41	WACHULA	FL	33873		77088490	147	Z	41			
333600	1	3/10/77	7/1/79	24	33	25	4	A	BUFORD E LONG	PO BOX 1620	WACHULA	FL	33873		77097310	160	Z	55			
335290	1	1/1/70	7/1/79	24	33	25	4	Z	BOWMEN K W	NO ADDRESS	NO CITY	FL			77134490	182	Z	84			
336776	1	1/1/70	7/1/79	27	33	25	5	D	G DAVIS	NO ADDRESS	NO CITY	FL			78008060	127	Z	21			
340269	1	1/1/70	7/1/79	27	33	25	4	D	MILLER,E J	NO ADDRESS	NO CITY	FL			78074740	122	Z	52			
347802	1	9/18/79	10/6/79	26	33	25	2	D	B.T. PRESTRIDGE	ROUTE 2, BOX 32	WACHULA	FL	33873			125	Z	30			
364997	1	5/12/81	9/11/81	24	33	25	6	A	PAUL CHILDRESS	ROUTE 2, BOX 50	WACHULA	FL	33873			225	Z	135			
367538	1	7/20/81	7/24/81	24	33	25	4	D	RIVERS, ARNOLD	RT 2, BOX 51	WACHULA	FL	33873			150	Z	62			
374548	1	5/17/82	6/11/82	27	33	25	6	A	LOLA ORTON	ROUTE 2, BOX 26	WACHULA	FL	33873			300	Z	125	273459.2	814749.14	
394987	1	8/13/84	10/22/84	27	33	25	4	A	MILLER, EARL J	RT 2 BOX 22C	WACHULA	FL	33873			90	Z	21			
401180	1	2/27/85	3/6/85	25	33	25	4	D	MILLIGAN, SHIRLEY	152 AIRPORT ROAD	WACHULA	FL	33873			175	C	50			
407787	1	8/29/85	1/18/86	23	33	25	6	A	JESSE BARNETT	6 E BROADWAY	FORT MEADE	FL	33815			550	C	75			
426518	1	1/13/87	1/29/87	27	33	25	6	A	CONSOLIDATED PRODUCTS, INC.	500 EAST CENTRAL AVE.	WINTER HAVEN	FL	33880			213	A	135	273434.9	814226.2	
426519	1	1/13/87	2/13/87	27	33	25	6	A	CONSOLIDATED PRODUCTS, INC.	500 EAST CENTRAL AVE.	WINTER HAVEN	FL	33880			715	A	320	273427.8	814225.87	
438324	1	9/22/87	11/5/87	23	33	25	6	A	GRACE, BILLY T	RT 2 BOX 53	WACHULA	FL	33873			675	A	370			
440098	1	11/3/87	1/30/88	27	33	25	4	B	PARRISH, WAYNE	HEARD BRIDGE ROAD	WACHULA	FL	33873			154	A	30			
501244	1	7/5/90	8/26/90	27	33	25	4	D	PARRISH, WAYNE	RT 2 BOX 22 WAUCHULA	WACHULA	FL	33873			176	B	83			
531754	1	11/10/92	11/12/92	24	33	25	2	O	MOBIL MINING AND MINERALS	PO BOX 550	FORT MEADE	FL	33841			13	B	3			
531754	2	11/10/92	11/12/92	24	33	25	2	O	MOBIL MINING AND MINERALS	PO BOX 550	FORT MEADE	FL	33841			13	B	3			
531754	3	11/10/92	11/12/92	24	33	25	2	O	MOBIL MINING AND MINERALS	PO BOX 550	FORT MEADE	FL	33841			13	B	3			
535781	1	3/12/93	3/30/93	27	33	25	4	D	ADRIAN R CHAPMAN	PO BOX 366	WACHULA	FL	33873-0366			256	B	130			
584187	1	11/7/96	7/2/97	25	33	25	4	B	LAKE DALE BAPTIST CHURCH	3122 HEARD BRIDGE RD	WACHULA	FL	33873	3122 HEARD BRIDGE RD		171	A	74			
601175	1	1/12/98	2/5/98	26	33	25	4	D	MARK SCHUMANN	1986 HEARD BRIDGE RD	WACHULA	FL	33873	1998 HEARD BRIDGE RD		180	B	119			
605132	1	5/5/98	5/7/98	25	33	25	3	Y	CARGILL FERTILIZER INC	3900 PEEPLES RD	FORT MEADE	FL	33841	BOYD COWART ROAD		80	Z	80			
608917	1	8/6/98	8/24/98	27	33	25	2	Y	CARGILL FERTILIZER INC	3900 PEEPLES RD	FORT MEADE	FL	33841	HEARD BRIDGE ROAD		81	Z	81			
611051	1	10/7/98	11/4/98	23	33	25	6	H	CARGILL FERTILIZER INC	3900 PEEPLES RD	FORT MEADE	FL	33841	OFF DR. BANKS RD		900			273556.2	814659.3	
637224	1	6/5/00	6/9/00	25	33	25	5	D	CARGILL FERTILIZER INC	3900 PEEPLES RD	FORT MEADE	FL	33841	2894 HEARD BRIDGE ROAD		132	B	86			
680065	1	1/24/03		26	33	25	4	D	WILLIAM E DAVIS	1986 HEARD BRIDGE RD	WACHULA	FL	33873	1992 HEARN BRIDGE RD			B				
309968	1	1/1/70	7/1/79	36	33	25	4	B	NO NAME	NO ADDRESS	NO CITY	FL			72011840*	198	Z	48			
312355	1	1/1/70	7/1/79	36	33	25	4	D	W B GILL	NO ADDRESS	NO CITY	FL			72098760	188	Z	66			
312795	1	1/1/70	7/1/79	36	33	25	4	D	R J LOWE JR	NO ADDRESS	NO CITY	FL			72109600	190	Z	107			
313254	1	1/1/70	7/1/79	36	33	25	4	D	CATALINA CO	NO ADDRESS	NO CITY	FL			72121520*	168	Z	61			
315440	1	1/1/70	7/1/79	36	33	25	6	B	ED R BRAUN	NO ADDRESS	NO CITY	FL			73053890*	400	Z	75			
315821	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			73063280*	197	Z	40			
316335	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			73076020*	165	Z	42			
316336	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			73076030*	165	Z	42			
322299	1	1/1/70	7/1/79	36	33	25	4	D	R GILLARD	NO ADDRESS	NO CITY	FL			74072550*	158	Z	50			
324600	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			74130420*	160	Z	50			
324601	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			74130430*	170	Z	52			
324603	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			74130450*	175	Z	50			
324604	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			74130460*	155	Z	51			
324605	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			74130470*	160	Z	50			
324606	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			74130480*	165	Z	42			
324607	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			74130490*	160	Z	42			
325341	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			75016370*	165	Z	54			
325342	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			75016380*	170	Z	52			
325343	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			75016390*	155	Z	48			
325555	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			75021140*	170	Z	54			
326451	1	1/1/70	7/1/79	36	33	25	4	D	R GIFFIARD	NO ADDRESS	NO CITY	FL			75042520*	175	Z	57			
326454	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			75042560*	170	Z	52			
326455	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			75042570*	185	Z	53			
326456	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			75042580*	175	Z	53			
326457	1	1/1/70	7/1/79	36	33	25	4	D	R GILLIARD	NO ADDRESS	NO CITY	FL			75042590*	185	Z	60			

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SWFWMD WELL INVENTORY

WCP No.	Well No.	Issued	Completed	Section	Township	Range	Diameter	Well Use Code	Owner's Name	Owner's Address	Owner's City	Owner's State	Owner's Zip	Well Location	Reference No.	Well Depth	Casing Mat'l	Case Depth	Latitude	Longitude	Pump (gpm)
522193	1	2/25/92	3/4/92	2	34	25	4	Y	BAGWELL, THOMAS & LOIS	97 LAKE DAMON DRIVE	AVON PARK	FL	33826			220	A	80			
528865	1	8/20/92	11/2/92	3	34	25	4	D	SCOTT SAUNDERS	PRIVATE DRIVE OFF HERBBRID	WAUCHULA	FL	33873			226	A	89			
540189	1	6/30/93	7/12/93	3	34	25	4	D	CHARLES JONES	120 N. FIRST AVE.	WAUCHULA	FL	33873			197	A	80			
543416	1	9/27/93	11/10/93	1	34	25	5	D	LOUIS E STEPHENS	P O BOX 813	WAUCHULA	FL	33873			200	B	80			
545501	1	11/24/93	12/1/93	3	34	25	4	U	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			25	B	3			
545501	2	11/24/93	12/1/93	3	34	25	4	U	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			25	B	3			
545502	1	11/24/93	12/1/93	3	34	25	4	U	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			25	B	3			
545502	2	11/24/93	12/1/93	3	34	25	4	U	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			25	B	3			
545502	3	11/24/93	12/1/93	3	34	25	4	U	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			25	B	3			
545502	4	11/24/93	12/1/93	3	34	25	4	U	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			25	B	3			
545502	5	11/24/93	12/1/93	3	34	25	4	U	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			25	B	3			
545502	6	11/24/93	12/1/93	3	34	25	4	U	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			25	B	3			
545502	7	11/24/93	12/1/93	3	34	25	4	U	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			25	B	3			
545502	8	11/24/93	12/1/93	3	34	25	4	U	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610			25	B	3			
550161	1	3/29/94	3/30/94	3	34	25	4	O	SHAHA #4 INC	423 901 HIGHWAY 17 NORTH	WAUCHULA	FL	33873			12	B	2			
550161	2	3/29/94	3/30/94	3	34	25	4	O	SHAHA #4 INC	423 901 HIGHWAY 17 NORTH	WAUCHULA	FL	33873			12	B	2			
561212	1	12/9/94	12/9/94	3	34	25	2	O	CITY OF WAUCHULA	726 GREEN ST	WAUCHULA	FL	33873	SR 652 NE		12	B	2			
561212	2	12/9/94	12/9/94	3	34	25	2	O	CITY OF WAUCHULA	726 GREEN ST	WAUCHULA	FL	33873	SR 652 NE		12	B	2			
561212	3	12/9/94	12/9/94	3	34	25	2	O	CITY OF WAUCHULA	726 GREEN ST	WAUCHULA	FL	33873	SR 652 NE		12	B	2			
561212	4	12/9/94	12/9/94	3	34	25	2	O	CITY OF WAUCHULA	726 GREEN ST	WAUCHULA	FL	33873	SR 652 NE		12	B	2			
567069	1	5/8/95	5/12/95	2	34	25	4	D	EDWARD WAYNE LAMBERT	P.O. BOX 1274	ZOLFO SPRINGS	FL	33890	NORTH END OF HOWZE ROA		260	C	84			
587223	1	1/15/97	1/20/97	3	34	25	4	A	MONIES, IVALEAH	307 EAST MAIN STREET	WAUCHULA	FL	33873	CORNER OF 64A & 3RD AVEN		260	A	89			
592399	1	5/9/97	5/12/97	3	34	25	2	Y	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610	1102 E MAIN ST, WAUCHULA		15	B	2			
592399	2	5/9/97	5/12/97	3	34	25	2	Y	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610	1102 E MAIN ST, WAUCHULA		15	B	2			
592399	3	5/9/97	5/12/97	3	34	25	2	Y	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610	1102 E MAIN ST, WAUCHULA		15	B	2			
592399	4	5/9/97	5/12/97	3	34	25	2	Y	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610	1102 E MAIN ST, WAUCHULA		15	B	2			
630517	1	1/20/00	1/30/00	3	34	25	2	A	JOY FISHER	101 5TH RD AVE	WAUCHULA	FL	33873	EAST MAIN ST CORNER OF 3		56	B	22			
631050	1	2/3/00	2/3/00	1	34	25	2	O	HARDEE COUNTY REGIONAL SANATARY	AIRPORT RD	WAUCHULA	FL	33873	LANDFILL @ AIRPORT ROAD		12	B	2			
631050	2	2/3/00	2/3/00	1	34	25	2	O	HARDEE COUNTY REGIONAL SANATARY	AIRPORT RD	WAUCHULA	FL	33873	LANDFILL @ AIRPORT ROAD		12	B	2			
631050	3	2/3/00	2/3/00	1	34	25	2	O	HARDEE COUNTY REGIONAL SANATARY	AIRPORT RD	WAUCHULA	FL	33873	LANDFILL @ AIRPORT ROAD		12	B	2			
631050	4	2/3/00	2/3/00	1	34	25	2	O	HARDEE COUNTY REGIONAL SANATARY	AIRPORT RD	WAUCHULA	FL	33873	LANDFILL @ AIRPORT ROAD		12	B	2			
631395	1	2/11/00	2/15/00	3	34	25	2	O	HELENA CHEMICAL COMPANY	2486 E MAIN ST	WAUCHULA	FL	33873	2486 E MAIN ST	WBP	15	B	5			
631395	2	2/11/00	2/15/00	3	34	25	2	O	HELENA CHEMICAL COMPANY	2486 E MAIN ST	WAUCHULA	FL	33873	2486 E MAIN ST	WBP	15	B	5			
631395	3	2/11/00	2/15/00	3	34	25	2	O	HELENA CHEMICAL COMPANY	2486 E MAIN ST	WAUCHULA	FL	33873	2486 E MAIN ST	WBP	15	B	5			
631395	4	2/11/00	2/15/00	3	34	25	2	O	HELENA CHEMICAL COMPANY	2486 E MAIN ST	WAUCHULA	FL	33873	2486 E MAIN ST	WBP	15	B	5			
635012	1	4/26/00	5/12/00	1	34	25	4	A	WESLEY TATUM	2451 EDGE DR	WAUCHULA	FL	33873	2451 EDGE DR		235	B	58			
638439	1	6/22/00	7/6/00	3	34	25	2	Y	CITY OF WAUCHULA	155 GRIFFIN RD	WAUCHULA	FL	33873	SR 652 NE		10	B	10			
638439	2	6/22/00	7/6/00	3	34	25	2	Y	CITY OF WAUCHULA	155 GRIFFIN RD	WAUCHULA	FL	33873	SR 652 NE		10	B	10			
638439	3	6/22/00	7/6/00	3	34	25	2	Y	CITY OF WAUCHULA	155 GRIFFIN RD	WAUCHULA	FL	33873	SR 652 NE		10	B	10			
638439	4	6/22/00	7/6/00	3	34	25	2	Y	CITY OF WAUCHULA	155 GRIFFIN RD	WAUCHULA	FL	33873	SR 652 NE		10	B	10			
639810	1	7/24/00	9/9/00	2	34	25	4	A	MARK LAMBERT	PO BOX 1513	WAUCHULA	FL	33873-151	SHAKELFORD ROAD		405	A	84			75
651743	1	4/23/01	4/25/01	3	34	25	2	O	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610	1102 E MAIN ST		15	B	3			
651743	2	4/23/01	4/25/01	3	34	25	2	O	CIRCLE K CORP	5650 BRECKENRIDGE PKWY #30	TAMPA	FL	33610	1102 E MAIN ST		15	B	3			
655165	1	6/21/01	6/22/01	1	34	25	4	D	ANDREW RIGNEW	311 PARK DR	WAUCHULA	FL	33873	AIRPORT ROAD		220	C	84			
666677	1	3/26/02	3/27/02	1	34	25	4	D	ROGER CONLEY	653 HANCHEY RD	WAUCHULA	FL	33873	2825 EAST MAIN STREET		260	C	92			
669997	1	5/29/02	6/16/02	1	34	25	4	D	EXIE BARNETT	127 MALEY RD	WAUCHULA	FL	33890	127 MANLEY RD		212	A	83			25
672422	1	7/17/02	7/18/02	1	34	25	4	D	ANTONIO LEON	PO BOX 2102	WACHULA	FL	33873	E MAIN/NORTH ON HWY 664		200	C	84			
677743	1	11/18/02	11/25/02	1	34	25	4	D	CHRIS & MARYLS EDLEY	2422 EDGE DR	WACHULA	FL	33873	2422 EDGE DRIVE		210	C	51.4			
678486	1	12/9/02		1	34	25	4	D	DARWIN & MARY JANE MCLEOD	PO BOX 813	WACHULA	FL	33873	454 BOYD COWART ROAD			C				

* Shaded cells with astericks refer to the SWFWMD permits located within this attachment.

F:\project\hardee\09199033.08\swpermit\swfwmd info\wellinventory.xls

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)
5060 U.S. Hwy 41 South, Brooksville, Florida 33512
904/796-7211

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

PERMIT NO.: 38468-20

STIPULATIONS REQUIRED: —
(See Reverse)

DATE: Aug 5 1983

Caesar Blackburn 2050
DRILLING CONTRACTOR LICENSE NUMBER
401 South 11th Ave
ADDRESS STREET OR BOX NO. CITY ZIP CODE
Wauchula FLA
(PLEASE TYPE OR PRINT IN ABOVE SPACE)

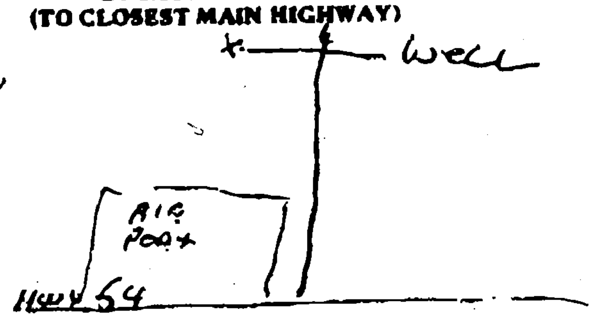
Requests authorization to construct, repair, modify a well for:
(Circle One)

Hardee County Regional Sanitary Landfill — Airport Road
NAME OF WELL OWNER — ADDRESS OF WELL LOCATION — STREET OR BOX NO. — CITY — ZIP CODE

Hardee Co. Commissioners — Wauchula Fla. 33873
OWNERS MAILING ADDRESS — STREET OR BOX NO. — CITY — ZIP CODE

TYPE OF EQUIPMENT: Rotary
APPROXIMATE DEPTH: 200 Ft DIAMETER: 4"
APPROXIMATE CASED DEPTH: 60 Ft CASING MATERIAL: Black iron
SEAL: Cement PURPOSE: INDUSTRIAL
LEGAL DESCRIPTION:
QTR: ______ QTR ______ SEC 35 TWP 33 S. RGE 25 E.
LOT ______ BLK. ______ UNIT ______ SUBDIVISION ______
COUNTY: Hardee
FIRE PROTECTION & WASHING VEHICLES

LOCATION SKETCH
(TO CLOSEST MAIN HIGHWAY)



I agree to furnish a Completion Report within 30 days after drilling operations cease and to comply with all the provisions of the Rules and Regulations of the SWFWMD(R) relative to well construction. Driller should supply a copy of the Completion Report to the owner.

I understand if the withdrawal is from a well having an inside diameter of six inches (6") or more or if the withdrawal during any single day is to exceed one-million (1,000,000) gallons or if the average annual daily withdrawal is to exceed one hundred thousand (100,000) gallons average per day on an annual basis, then a Consumptive Use Permit must be approved prior to the Construction Permit being authorized.

Signature of Drilling Contractor Caesar Blackburn

Signature of Owner or His Authorized Agent Caesar Blackburn

DO NOT WRITE BELOW THIS LINE—FOR OFFICIAL USE ONLY

GRANTED BY: Joseph W. Richels DATE: August

TITLE: Supervisor of Enforcement

Southwest Florida Water Management District Regulatory RECEIVED AUG 0 1983

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED BY AN AUTHORIZED OFFICER OF SWFWMD(R). IT SHALL BE KEPT AT THE WELL SITE DURING ALL DRILLING OPERATIONS.

CUP NO. ______ 8.18.83 JAL

SWFWMD(R)
SF 306(3) Rev. 4/79

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
WELL COMPLETION REPORT

OWNER: HARDEE CO. [illegible] Last Name / Initial
HARDEE CO. [illegible] Number / Street
WAUCHULA City / FLA State
Area Code / Phone Number / 33873 Zip Code

WELL LOCATION: ¼ ¼ ¼ of Section 35
33 S (N-S) 24 E (E-W) Township / Range
Latitude Deg. Min. Sec. N
Longitude Deg. Min. Sec. W
Locate in Section

Number / Street/Road
Lot No. / Subdivision
City / County HARDEE

OWNER WELL NUMBER OR NAME: HARDEE [illegible]

DRILL METHOD: [X] Rotary [ ] Cable Tool [ ] Jet [ ] Auger [ ] Other

SURFACE CASING, CASING, AND LINER MATERIAL:

Blk.	Galv.	S. Steel	Wt. (lb/ft)	PVC	Other	From (Ft.)	To (Ft.)	Schedule No.	Joints
4"			SCH40			0	54		

GROUT: [ ] None [X] Neat Cement [ ] Other:

Type and Percent of Additives and Grout Volume or Number of 94 lb. Sacks	From (Ft.)	To (Ft.)
4 SACKS	0	18

FINISH: [X] Open Hole [ ] Perforated or Slotted Casing [ ] Gravel Pack [ ] Sandpoint or Screen

QUALITY TEST: [X] None [ ] Bacteria [ ] Chemical

Well Disinfected: [ ] No [X] Yes

WELL TEST, by: [ ] Natural Flow [ ] G.P.M. [X] Airlift
Discharge Measured By: [X] Estimated

Measured Static Water Level: 170 Ft.
Measuring Pt. (Describe): TOP 4" CASING
Which is 1 Ft. [X] Above [ ] Below Land Surface

WELL EQUIPMENT: [ ] Open [X] Capped [ ] Valved

DER FORM 17-1.122 (38)

IMS UPDATE

TYPE OF WORK: [X] New Construction [ ] Repair [ ] Deepening [ ] Plugging [ ] Other

PERMIT NUMBER: 384465-20

WELL NUMBER

TYPE OF WELL: [X] Water Well [ ] Test Well [ ] Recharge [ ] Drainage [ ] Waste Disposal [ ] Observation [ ] Other

USE: [ ] Domestic [ ] Irrigation [X] Industrial [ ] Livestock [ ] Public Supply [ ] Other: FIRE PROTECTION + WASHING VEHICLES

SKETCH LOCATION OF WELL in relation to local landmarks, giving distance and direction from nearest town, road, or other reference point.

WELL

AIRPORT RD

HWY 64A

GEOPHYSICAL LOGS: Type: By:

WELL LOG

Bore Hole (In.)	Casing Size (In.)	From	To	Examine cuttings at 20 ft. or smaller intervals and at changes. Give color, grain-size and type of material. Note any cavities. Indicate producing zones. Attach additional sheets if necessary.
8"	4"	0	18	GRAYSH SAND SAND CAVING IN
4"	4"	18	26	GRAYSH ROCK
		26	35	HARD GREENCLAY
		35	52	GREENISH GRAY CLAY BLACKSPECKS
4"	4"	52	130	GRAYSH ROCK WITH BLACKSPECKS
		130	160	GRAYSH ROCK
4"		160	200	GRAYSH AND BROWN LIMEROCK
				CASING DRIVEN 18FT TO 54FT

RECEIVED by Southwest Florida Water Management District JAN WELL PERMITTING Brooksville, Florida

Total Depth 200 Ft.
[X] Limestone
Top of Producing Zone 160 Ft., Bottom of Producing Zone 200 Ft.

2550 License No.
Water Well Contractor's Signature

10 20 83 Completion Date
Driller Signature

No.7944 P. 3 Sep.16. 2003 1:59PM

Please complete in black ink or type

Form No. 25-18-5/83

WELL COMPLETION REPORT

Owner's Name HARDEE COUNTY

Permit Number: 510 327-20

x [signature] 4/91 P.S.W.

Water Well Contractor's Signature   Completion Date

License No. 2050

SURFACE CASING, CASING AND LINER MATERIAL:

Types	Diam. (In.)	From (Ft.)	To (Ft.)
Steel	4"	0	63

Neat Cement: No. of Bags	From (Ft.)	To (Ft.)
18 sacks		

IRON: ___ ppm SULFATES: ___ ppm CHLORIDES: ___ ppm

FINISH: Screen: ______ (Ft.) Open Hole: ______ (Ft.)

WELL LOCATION

___ ¼ ___ ¼ ___ ¼ of Section 35

33 Township S (N-S) 23 Range E (E-W)

Locate in Section

Latitude ___ Deg. ___ Min. ___ Sec. N

Longitude ___ Deg. ___ Min. ___ Sec. W

Optional may be required

cc: J.M.

DRILL METHOD

[X] Rotary [ ] Cable Tool [ ] Jet [ ] Auger Other______

Measured Static Water Level ______ + ______ - 23 Ft.

Measured Pumping Water Level ______ + ______ - ______ Ft.

After ______ Hours At ______ G.P.M. 11

Measuring Pt. (Describe): TOP 4"

Which is 1 Ft. [X] Above [ ] Below Land Surface

Depth (Ft.) From	To	Examine cuttings at 20 ft. or smaller intervals and at changes. Give color, grain-size and type of material. Note any cavities. Indicate producing zones. Attach additional sheets if necessary.
0	17	TOPSOIL AND CLAY
17	50	TANISH LIMEROCK
		AND GREENISH CLAY
		SOME PHOSPHATE
50	160	TANISH GRAYISH LIMEROCK
		SOME CLAY IN CAVES
160	197	TANISH AND GRAYISH
		BROWN LIMEROCK
		WITH CREVICES

Southwest Florida Water Management District Regulatory
RECEIVED
MAY 13 1991
Well Permitting

Driller's Name [signature]

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)
2379 Broad St., Brooksville, Florida 34609-6899
904/796-7211

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

PERMIT NO.: 510327 - 70
STIPULATIONS REQUIRED: #3
(See Reverse)
DATE: ____________

Ceasar Blackburn	#2050
Drilling Contractor	License Number
401 South 11th Avenue, Wauchula, Fla 33873	
Address Street or Box No. City	Zip Code

(Please type or print in above space)

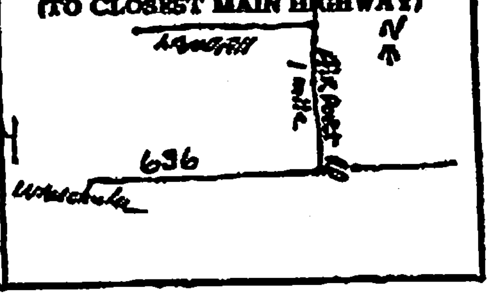
Requests authorization to construct repair, modify a well for:
(Circle One)

Hardee County at Hardee Co. Sanitary Landfill, Airport Rd, Wauchula, Fla 33873
Name of Well Owner — Address of Well Location Street or Box No. City Zip Code

74 Hanchey Road Wauchula, Fla. 33873
Owners Mailing Address Street or Box No. City Zip Code

TYPE OF EQUIPMENT: Rotary
APPROXIMATE DEPTH: 300 ft DIAMETER: 4"
APPROXIMATE CASED DEPTH: 80 ft CASING MATERIAL: Steel
GROUT MATERIAL: Cement PURPOSE: Public Supply
LEGAL DESCRIPTION:
QTR: ____ QTR: ____ SEC. 35 TWP. 33 S RGE. 25-E
LOT ____ BLK. ____ UNIT ____ SUBDIVISION ____
COUNTY Hardee

LOCATION SKETCH (TO CLOSEST MAIN HIGHWAY)



I agree to furnish a Completion Report within 30 days after drilling operations cease and to comply with all the provisions of the Rules and Regulations of the SWFWMD (R) relative to well construction. Driller should supply a copy of the Completion Report to the owner.

I understand if the withdrawal is from a well having an inside diameter of six inches (6") or more or if the withdrawal during any single day is to exceed one-million (1,000,000) gallons or if the average annual daily withdrawal is to exceed one hundred thousand (100,000) gallons average per day on an annual basis, then a Consumptive Use Permit must be approved prior to the Construction Permit being authorized.

Signature of Drilling Contractor [illegible]

Signature of Owner or His Authorized Agent [illegible]

DO NOT WRITE BELOW THIS LINE - FOR OFFICIAL USE ONLY

GRANTED BY: [illegible] DATE: Feb 7, 1991

TITLE: Hydrologist III

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED BY AN AUTHORIZED OFFICER OF SWFWMD(R). IT SHALL BE KEPT AT THE WELL SITE DURING ALL DRILLING OPERATIONS.

CUP NO. ____________

cc: J.C.
J.E.
Ewer

RECEIVED DEC 19 1990

SF 306(3) Rev. 4/79

SWFWMD FILE COPY

Sep. 16. 2003 1:59PM No.7944 P. 4

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
WELL GROUTING INSPECTION REPORT

Well Permit No. 510327.20 Section 35 Township 33 Range 25

Drilling Contractor CEASAR BLACKBURN License No. 2050

Address of Well: Street 74 HANCHEY Rd.

County HARDEE City WAUCHULA Zip 33873

Property Owner HARDEE County CUP No. ________

WELL SPECIFICATIONS

Does actual well location match approved 17-22 PSW site plan? Yes, No (Investigate)

Drill method: Rotary, Cable Tool, Combination, Other ________

T.D. of Well ________

Casing: Height above ground 18" Diameter 4" Depth 63'

Material - Black Steel, Galv. Steel, PVC, Other ________

Joining - Weld, T & C, Solvent Bond, Other ________

Was sand casing used? Yes - Depth ________ No

Is well information verified by driller's log? Yes, No (Explain in Comments)

GROUT SPECIFICATIONS AND INSPECTION

Grout space: –	TOP-BOTTOM-FULL	TOP-BOTTOM-FULL	TOP-BOTTOM-FULL
Date	2-27-91		
Time arrived at site	10:30 AM		
Grout interval	63' casing		
*Estimated No. of 94 lb. sacks or yds. of cement	12.6		
Time grout started	10:40 AM		
Time grout completed	11:20 AM		
Actual No. of 94 lb. sacks or yds. of cement (specify type of cement)	18.0		
Gallons of water per 94 lb. sack or yds. of cement	5.5		
Special grout additives, type, amount	None		
Grout method (see terms on back of page)	Pressure bond Thru drill stem & casing		
Time departed site	11:25 AM		

*Estimate before grouting begins (see back of page for grout tables).

COMMENTS

no problems.

Southwest Florida Water Management District RECEIVED MAR 04 1991 Well Permitting

Attach a Field Investigation Report for unsatisfactory work.

Drillers Signature Ceasar Blackburn Date 2/27/91

Observers Signature William D. Wood Date 2/27/91

Work satisfactorily completed in accordance with Chapter 17-22, and 17-21.10, F.A.C.

Supervisors Signature J. Blanke Date 2-28-91

(Not official unless signed by SWFWMD Supervisor)

DISTRICT COPY

No.1944 P. 3 Sep. 16. 2003 1:59PM

BEST AVAILABLE COPY

COMPLETION REPORT AND WELL LOG

TO: Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Permit Number:
Well started – date:
Well completed – date:

BLD Contractor

Well owner: Name and Address: Bonnie Gilliard Wauchula Fla

Well location: County: Hardee

Tests taken: ☐bacterial ☐chemical ☐
by: ☐County Health Department ☐other

9S 33 26
SECTION, TOWNSHIP, RANGE

INDICATE WELL LOCATION IN THE SECTION

Purpose of well:
☒ domestic ☐public water supply ☐irrigation ☐stock
☐industrial ☐other

Pump ______ HP, Type ______ ☐electric ☐diesel

Yield ______ GPM. ☐Well not pumped. ☐Well flows above land surface

Water level above/below land surface before pumping 30 feet. Water level lowered to ______ feet after ______ minutes pumping at ______ GPM.

Method of drilling: ☐rotary ☐cable tool ☐jet ☐other

Finish: ☐open hole ☐sand point ☐well screen placed at ______ feet and ______ feet. depth packer set ______ feet.

CASING CONSTRUCTION

COLOR OF MATERIAL	CHARACTER OF MATERIAL (NOTE EACH TYPE OF MATERIAL AND CAVITIES IF ANY)	FROM FT.	TO FT.
Yellow	SAND	[illegible]	10
"	CLAY	10	30
Gray	ROCK	30	[illegible]
"	HAWTHORNE	[illegible]	[illegible]
White	ROCK	[illegible]	[illegible]
Gray	HAWTHORNE	[illegible]	110
White	LIME	[illegible]	[illegible]
Brown	Hard LIME	156	170

RECEIVED
MAY 1 5 2003
SCS ENGINEERS

USE CONTINUATION SHEET FOR LOG OF WELLS DEEPER THAN 300 FEET

Well Completed By: [illegible]

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

To: Chief Hydrologist, SWFWMD(R)
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date 5-10-73

(TYPE OR USE BALLPOINT PEN AND PRESS HARD)

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

Douglas WD. F87 604 S 8th Wauchula Fla
DRILLING CONTRACTOR NUMBER ADDRESS

requests authorization to construct a well for Ronnie Gilliard
NAME OF WELL OWNER

Zolfo
ADDRESS (MAILING STREET OR BOX NO. CITY ZIP CODE

Well will be 4 inches in diameter. Proposed yield to be 20 GPM.

Well will be constructed with [X] cable tool [ ] rotary [ ] jetted [ ] other (specify) ________

Well will be approximately 260 feet deep. Well will have about 42 feet of casing

[X] black pipe [ ] galvanized [ ] other ________

Casing will be joined by [X] coupling [ ] weld [ ] both. Space between casing and hole will be sealed with:

[X] natural materials [ ] neat cement grout [ ] other ________

Well will be located at 25 33 25 Hardee Co.
SECTION TOWNSHIP RANGE AND STREET ADDRESS CITY

Well will be used for [X] private supply [ ] public water supply [ ] irrigation [ ] industrial

[ ] test well [ ] other ________

If this permit is for repair, modification or alteration of a well constructed under a previous permit give number

________ and indicate work to be done ________

If for modification of a pumping facility which will change quantity pumped indicate old pump capacity and HP

________ GPM new pump ________ HP ________ GPM

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor Carl Douglas

Access to proposed well site for inspection at any reasonable time is hereby granted personnel of Southwest Florida Water Management District (Regulatory).

Signature of Owner or his Agent Ronnie Gilliard

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY

73 72-84

PERMIT TO CONSTRUCT A WELL

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and permission for construction of the well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ________, as described on the reverse side of this form, shall be required.

This permit does not imply approval of sewage or other waste disposal facilities, or of those supply and other facilities in the area to be supplied by the well.

Granted by: [signature] Date 5-15-73

Title ________

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS

PROMINENTLY DISPLAYED

SWFWMD (R)
SF1710

DRILLER COMPLETION REPORT AND WELL LOG

TO: Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Permit Number [illegible]
Well started – date [illegible]
Well completed – date [illegible]

Well owner: Name and Address: Ronnie Gillard Wauchula Fla

Well location: County Hardee

25-32-26
SECTION, TOWNSHIP, RANGE

INDICATE WELL LOCATION IN THE SECTION

Tests taken: ☐ bacterial ☐ chemical ☐ none
by: ☐ County Health Department ☐ other

Purpose of well:

☒ domestic ☐ public water supply ☐ irrigation ☐ stock
☐ industrial ☐ other

Pump ______ HP. Type ______ ☐ electric ☐ diesel

Yield ______ GPM. ☒ Well not pumped. ☐ Well flows above land surface

Water level above/below land surface before pumping 30 feet. Water level lowered to ______ feet after ______ minutes pumping at ______ GPM.

Method of drilling: ☐ rotary ☒ cable tool ☐ jet ☐ other

Finish: ☒ open hole ☐ sand point ☐ well screen placed at ______ feet and ______ feet. depth packer set ______ feet.

CASING
(CHECK ONE)
☐ galvanized
☒ black iron
☐ other

(CHECK ONE)
☒ threaded, coupled
☐ T&C, welded
☐ weld only
☐ other

Casing depth
to
to
to
seated at
below land surface

COLOR OF MATERIAL	CHARACTER OF MATERIAL (NOTE EACH TYPE OF MATERIAL AND CAVITIES IF ANY)	FORMATION CHANGE	FROM FT.	TO FT.
Yellow	SAND		0	20
"	CLAY		20	39
Gray	ROCK		39	44
"	HAWTHORNE		44	80
White	ROCK		80	92
Gray	HAWTHORNE		92	120
White	LIME		120	135
Brown Hard	LIME		135	170

(USE CONTINUATION SHEET FOR LOG OF WELLS DEEPER THAN 300 FEET)

Well Contractor: R. D. Rice

BEST AVAILABLE COPY

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

To: Chief Hydrologist, SWFWMD(R)
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date 5-28-70

(TYPE OR USE BALLPOINT PEN AND PRESS HARD)

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

Dossey WD F87 604 S ... Lakeland Fla

DRILLING CONTRACTOR NUMBER ADDRESS

requests authorization to construct a well for Ronnie Gilliard

NAME OF WELL OWNER

Zolfo

ADDRESS (MAILING) STREET OR BOX NO. ZIP CODE

Well will be 4 inches in diameter. Proposed yield to be 30 GPM.

Well will be constructed with ☒ cable tool ☐ rotary ☐ jetted ☐ other (specify)

Well will be approximately 170 feet deep. Well will have about 40 feet of casing

☒ black pipe ☐ galvanized ☐ other

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)
DRILLER'S COMPLETION REPORT AND WELL LOG

TO: Chief Hydrologist, SWFWMD(R)
Post Office Box 457 Phone: (904) 796-3511
Brooksville, Florida 33512

Permit Number 72-1184-20
Well started – date 8-13-71
Well completed – date 9-22-71

Well owner: Name and Address H.C. Hagerty

Well location: County Hardee

36 33 25
SECTION, TOWNSHIP, RANGE

INDICATE WELL LOCATION IN THE SECTION

Tests taken: ☐ bacterial ☐ chemical ☐ none
by: ☐ County Health Department ☐ other

Purpose of well: ☒ domestic ☒ public water supply ☐ irrigation ☐ stock ☐ industrial ☐ other

Pump 1 HP. Type jet ☒ electric ☐ diesel

Yield 10 GPM. ☐ Well not pumped. ☐ Well flows above land surface

Water level above-below land surface before pumping 26 feet. Water level lowered to 26 feet after 180 minutes pumping at 1800 GPM.

Method of drilling: ☐ rotary ☒ cable tool ☒ jet ☐ other

Finish: ☐ open hole ☒ sand point ☐ well screen placed at 95 feet. and ___ feet. depth packer set ___ feet

CASING CONSTRUCTION

(CHECK ONE)
☐ galvanized
☒ black iron
☐ other

(CHECK ONE)
☒ threaded, coupled
☐ T&C, welded
☐ weld only
☐ other

Casing diam. ins. 4"
0 to 48 ft.
___ to ___ ft.
___ to ___ ft.
seated at 48 ft. below land surface.

DEPTH BELOW LAND SURFACE - FEET	CHARACTER OF MATERIAL (NOTE EACH TYPE OF MATERIAL AND CAVITIES IF ANY)	FORMATION CHANGE	FROM FT.	TO FT.
10–50	Quick Sand		0	48
60–150	clay / Water		48	150
160–200	Lime Rock / Water		150	198
210–300				

CASING IN WELL

(USE CONTINUATION SHEET FOR LOG OF WELLS DEEPER THAN 300 FEET)

Well Completed By: W. R. Turner F240 — W. R. Turner Well Drilling
DRILLER'S SIGNATURE AND NUMBER — FIRM NAME

SWFWMD(R) SF1711

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

72-1184
20

To: Chief Hydrologist, SWFWMD(R)
Post Office Box 457 Phone: (904) 796-3511
Brooksville, Florida 33512

Date 8-13-71

(TYPE OR USE BALLPOINT PEN AND PRESS HARD)

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

W. R. Turner W D F240 Rt 2 Wauchula
DRILLING CONTRACTOR NUMBER ADDRESS

requests authorization to construct a well for H C Hagerty
NAME OF WELL OWNER

RFD 2 Box 92A Wauchula 33873
ADDRESS (MAILING) STREET OR BOX NO. CITY ZIP CODE

Well will be 4 inches in diameter. Proposed yield to be 25 GPM.

Well will be constructed with ☐ cable tool ☐ rotary ☑ jetted ☐ other (specify) ______

Well will be approximately 100 feet deep. Well will have about 45 feet of casing

☑ black pipe ☐ galvanized ☐ other ______.

Casing will be joined by ☑ coupling ☐ weld ☐ both. Space between casing and hole will be sealed with:

☑ natural materials ☐ neat cement grout ☐ other ______.

Well will be located at 36-33-25 Wauchula Hardee 25
SECTION, TOWNSHIP, RANGE AND STREET ADDRESS CITY COUNTY

Well will be used for ☑ private supply ☐ public water supply ☐ irrigation ☐ industrial

☐ test well ☐ other ______.

If this permit is for repair, modification or alteration of a well constructed under a previous permit give number

______ and indicate work to be done ______

______

If for modification of a pumping facility which will change quantity pumped indicate old pump ______ HP

______ GPM. new pump ______ HP ______ GPM.

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor W. R. Turner

Access to proposed well site for inspection at any reasonable time is hereby granted personnel of Southwest Florida Water Management District (Regulatory).

Signature of Owner or his Agent H. C. Hagerty

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ______, as described on the reverse side of this form, shall be required.

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: [signature] Date 8-16-71

Title Chief Ops

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND

BEST AVAILABLE COPY

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)
DRILLE COMPLETION REPORT AN LL LOG

Permit Number 72-12152.5

: Chief Hydrologist, SWFWMD(R)
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Well started – date 7-4-72
Well completed – date 7-07-72

ell owner: Name and Address CATALINA CONSTRUCTION, INC. (FOR: RONALD DRISKELL) P.O. BOX 2796, WINTER HAVEN, FL 33880

ell location: County HARDEE

36-33-25
SECTION, TOWNSHIP, RANGE

INDICATE WELL LOCATION IN THE SECTION

Tests taken by: ☐ bacterial ☐ chemical ☑ none
☐ County Health Department
☐ other

CASING CONSTRUCTION
(CHECK ONE)
☐ galvanized
☑ black iron
☐ other

(CHECK ONE)
☐ threaded, coupled
☑ T&C, welded
☐ weld only
☐ other

Casing diam. ins.
4" to ___ ft.
___ to ___ ft.
___ to ___ ft.
seated at 61 ft.
below land surface.

Purpose of well:
☑ domestic ☐ public water supply ☐ irrigation ☐ stock
☐ industrial ☐ other ___

Pump 3/4 HP. Type Submersible ☑ electric ☐ diesel

Yield 13 GPM. ☑ Well not pumped. ☐ Well flows above land surface

Water level ~~above~~/below land surface before pumping 42 feet.

level lowered to — feet after — minutes pumping at — GPM.

Method of drilling: ☐ rotary ☑ cable tool ☐ jet ☐ other ___

Finish: ☑ open hole ☐ sand point ☐ well screen placed at ___ feet. and ___ feet.
depth packer set ___ feet.

COLOR OF MATERIAL	CHARACTER OF MATERIAL (NOTE EACH TYPE OF MATERIAL AND CAVITIES IF ANY)	FORMATION CHANGE	FROM FT.	TO FT.
			0	12
Brown	Sand		12	21
White	Sand		21	34
White	Sandy Clay		34	60
Grey	Clay		60	66
Black + White	Rock		66	74
Grey	Clay		74	76
Brown	Rock		76	92
Grey	Clay		92	96
Brown	Rock		96	128
White	Clay		128	132
Brown	Rock		132	140
White	Clay		140	145
Brown	Rock		145	150
White	Clay		150	168
Brown	Rock			

(USE CONTINUATION SHEET FOR LOG OF WELLS DEEPER THAN 300 FEET)

Well Completed By: C. L. Dickey D576 — DRILLER'S SIGNATURE AND NUMBER
C. D. Cannon & Sons — FIRM NAME

SWFWMD(R)

.OUT... EST LORIDA .ATER .ANAGE. ENT DISTRICT (REGULATOR.)
APPLICATI FOR A PERMIT TO CONSTRUC A WELL

f Hydrologist, SWFWMD(R)
ffice Box 457
sville, Florida 33512

Phone: (904) 796-3511

Date 6-29-72

TYPE OR USE BALLPOINT PEN AND PRESS HARD)

compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

C.D. CANNON & SONS, INC. (DRILLING CONTRACTOR) F-31 (NUMBER) BOX 815 FORT MEADE, FL 33841 (ADDRESS)

requests authorization to construct a well for CATALINA CONST. CO. FOR RONALD DRISKELL (NAME OF WELL OWNER)

P.O. BOX 2796 (ADDRESS (MAILING) STREET OR BOX NO.) WINTER HAVEN, FL (CITY) 33880 (ZIP CODE)

Well will be 4 inches in diameter. Proposed yield to be 20 GPM.

Well will be constructed with ☑ cable tool ☐ rotary ☐ jetted ☐ other (specify) ____

Well will be approximately 150 feet deep. Well will have about 80 feet of casing

☑ black pipe ☐ galvanized ☐ other ____.

Casing will be joined by ☐ coupling ☐ weld ☑ both. Space between casing and hole will be sealed with:

☑ natural materials ☐ neat cement grout ☐ other ____.

Well will be located at 36-33-25 (SECTION, TOWNSHIP, RANGE AND STREET ADDRESS CITY) HARDEE (COUNTY)

Well will be used for ☑ private supply ☐ public water supply ☐ irrigation ☐ industrial

☐ test well ☐ other ____.

If this permit is for repair, modification or alteration of a well constructed under a previous permit give number

____ and indicate work to be done ____

modification of a pumping facility which will change quantity pumped indicate old pump ____ HP

____ GPM. new pump ____ HP ____ GPM.

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor J. C. Cannon

Access to proposed well site for inspection at any reasonable time is hereby granted personnel of Southwest Florida Water Management District (Regulatory).

Signature of Owner or his Agent George T. Whisley

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY

72-12152

PERMIT TO CONSTRUCT A WELL

20

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ____ , as described on the reverse side of this form, shall be required.

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: B. L. Baker Date 6-30-72

Title Tech

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND W T RIN A D

PROMINENTLY DISPLAYED

SOUTHWEST FLORI WATER MANAGEMENT DIST CT (REGULATORY)
DRILLER'S COMPLETION REPORT AND WELL LOG

TO: Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Permit Number 73-06328-20
Well started – date 12/20/73
Well completed – date 12/26/73

Well owner: Name and Address RONALD GILLIARD

Well location: County HARDEE

Sec. 36 T-33-R-25E
SECTION, TOWNSHIP, RANGE

INDICATE WELL LOCATION IN THE SECTION

Tests taken: ☐ bacterial ☐ chemical ☑ none
by: ☐ County Health Department
☐ other

Purpose of well:

☑ domestic ☐ public water supply ☐ irrigation ☐ stock

☐ industrial ☐ other

Pump ______ HP. Type ______ ☐ electric ☐ diesel

Yield ______ GPM. ☑ Well not pumped. ☐ Well flows above land surface

Water level above/below land surface before pumping 28 feet. Water level lowered to ______ feet after ______ minutes pumping at ______ GPM.

Method of drilling: ☐ rotary ☑ cable tool ☐ jet ☐ other ______

Finish: ☐ open hole ☐ sand point ☐ well screen placed at ______ feet. and ______ feet.

depth packer set ______ feet.

CASING CONSTRUCTION

(CHECK ONE)
☐ galvanized
☑ black iron
☐ other

(CHECK ONE)
☑ threaded, coupled
☐ T&C, welded
☐ weld only
☐ other

Casing diam. ins. 4"
0 to 40 ft.
______ to ______ ft.
______ to ______ ft.
seated at ______ ft.
below land surface.

COLOR OF MATERIAL	CHARACTER OF MATERIAL (NOTE EACH TYPE OF MATERIAL AND CAVITIES IF ANY)	FORMATION CHANGE	FROM FT.	TO FT.
	SAND		0	40
WHITE	ROCK		40'	41'
BLUE	CLAY + ROCK		41'	65'
	ROCK		65'	75'
BLUE	CLAY + ROCK		75'	84'
BLACK + GRAY	ROCK		84'	91'
BLUE	CLAY + ROCK		91'	95'
	HAWTHORNE		95'	101'
WHITE	ROCK		101'	102'
	HAWTHORNE		102'	107'
WHITE	ROCK		107'	108'
	HAWTHORNE		108'	135'
WHITE	ROCK		135'	136'
	HAWTHORNE		136'	139'
GRAY	ROCK		139'	144'
	HAWTHORNE		144'	150'
BROWN	LIME ROCK		150'	197'

(USE CONTINUATION SHEET FOR LOG OF WELLS DEEPER THAN 300 FEET)

Well Completed By: Donald Barwick D-608 DOUGLAS W.D.
DRILLER'S SIGNATURE AND NUMBER FIRM NAME

SWFWMD(R)
SF1711

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)
APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

To: Chief Hydrologist, SWFWMD(R)
Post Office Box 457
Brooksville, Florida 33512
Phone: (904) 796-3511

Date Dec. 20 1972

(TYPE OR USE BALLPOINT PEN AND PRESS HARD)

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

Carl Douglas | F 87 | S. 8th St. Wauchula
DRILLING CONTRACTOR | NUMBER | ADDRESS

requests authorization to construct a well for Ronald Gilliard
NAME OF WELL OWNER

Wauchula, Fla 33873
ADDRESS (MAILING) STREET OR BOX NO. CITY ZIP CODE

Well will be 4 inches in diameter. Proposed yield to be 60 GPM.

Well will be constructed with ☑ cable tool ☐ rotary ☐ jetted ☐ other (specify) ____

Well will be approximately 120 feet deep. Well will have about 60 feet of casing

☐ black pipe ☑ galvanized ☐ other ____

Casing will be joined by ☐ coupling ☐ weld ☑ both. Space between casing and hole will be sealed with:

☑ natural materials ☐ neat cement grout ☐ other ____

Well will be located at 36 33 25 East Hardee
SECTION, TOWNSHIP, RANGE AND STREET ADDRESS CITY COUNTY

Well will be used for ☑ private supply ☐ public water supply ☐ irrigation ☐ industrial

☐ test well ☐ other ____

If this permit is for repair, modification or alteration of a well constructed under a previous permit give number ____ and indicate work to be done ____

If for modification of a pumping facility which will change quantity pumped indicate old pump ____ HP ____ GPM. new pump ____ HP ____ GPM.

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor Carl Douglas

Access to proposed well site for inspection at any reasonable time is hereby granted personnel of Southwest Florida Water Management District (Regulatory).

Signature of Owner or his Agent X Ronald Gilliard

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL 73-06328 20

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ____ , as described on the reverse side of this form, shall be required.

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: B. L. Baker Date 12-26-72

Title Tech

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND RI A I

PROMINENTLY DISPLAYED

SWFWMD (R)
SF1710

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)
DRILLE COMPLETION REPORT AND WELL LOG

SBH.

TO: Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Permit Number 73-05389.20
Well started – date 12-26-72
Well completed – date 1-20-73

Well owner: Name and Address Edward R. Brown Rt. 2 Wauchula Fla 33873

Well location: County Hardee
36 33 25
SECTION, TOWNSHIP, RANGE

INDICATE WELL LOCATION IN THE SECTION

Tests taken: ☐ bacterial ☐ chemical ☒ none
by: ☐ County Health Department ☐ other

Purpose of well:
☐ domestic ☒ public water supply ☐ irrigation ☐ stock
☐ industrial ☐ other

Pump 7½ HP. Type Sub ☒ electric ☐ diesel

Yield 150 GPM. ☐ Well not pumped. ☐ Well flows above land surface

Water level above/below land surface before pumping 40 feet. Water level lowered to ____ feet after ____ minutes pumping at ____ GPM.

Method of drilling: ☐ rotary ☒ cable tool ☐ jet ☐ other

Finish: ☐ open hole ☐ sand point ☐ well screen placed at ____ feet. Pump 57 and ____ feet. depth packer set 84 feet.

CASING CONSTRUCTION
(CHECK ONE)
☐ galvanized
☒ black iron
☐ other

(CHECK ONE)
☐ threaded, coupled
☒ T&C, welded
☐ weld only
☐ other

Casing diam. ins.
____ to ____ ft.
____ to ____ ft.
6 to ____ ft.
seated at 75 ft.
below land surface.

COLOR OF MATERIAL	CHARACTER OF MATERIAL (NOTE EACH TYPE OF MATERIAL AND CAVITIES IF ANY)	FORMATION CHANGE	FROM FT.	TO FT.
Sandy clay		0	0	21
Sandy hard clay			21	40
Stiff clay			40	67
lime-rock			67	69
lime clay			69	73
lime rock			73	78
white lime			78	102
lime rock			102	106
white lime			106	134
Lime rock little water			134	140
white lime			140	162
Brown lime rock little water			162	180
Tampa lime			180	260
lime rock			260	266
Tampa lime			266	345
Brown lime rock little water			345	370
Tampa lime			370	390
water rock			390	400

(USE CONTINUATION SHEET FOR LOG OF WELLS DEEPER THAN 300 FEET)

Well Completed By: H M Keen C 111 — H M Keen & Sons
DRILLER'S SIGNATURE AND NUMBER — FIRM NAME

SWFWMD(R)
SF1711

...JUT... ..EST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)

APPLICA... ON FOR A PERMIT TO CONST... CT A WELL

To: Chief Hydrologist, SWFWMD(R)
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date Nov 24 72

(TYPE OR USE BALLPOINT PEN AND PRESS HARD)

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

H M Keane & Sons (DRILLING CONTRACTOR) F 40 (NUMBER) Route 1 Wauchula 33873 (ADDRESS)

requests authorization to construct a well for Edward R. Brown (NAME OF WELL OWNER)

Rt #2 (ADDRESS (MAILING) STREET OR BOX NO.) Wauchula Fla. (CITY) 33873 (ZIP CODE)

Well will be 6 inches in diameter. Proposed yield to be 150 GPM.

Well will be constructed with ☒ cable tool ☐ rotary ☐ jetted ☐ other (specify) ____

Well will be approximately 400 feet deep. Well will have about 80 feet of casing

☒ black pipe ☐ galvanized ☐ other ____

Casing will be joined by ☐ coupling ☐ weld ☒ both. Space between casing and hole will be sealed with:

☐ natural materials ☐ neat cement grout ☐ other ____

Well will be located at 36 33 25 airport Rd No 644 (SECTION, TOWNSHIP, RANGE AND STREET ADDRESS) (CITY) Hardee (COUNTY)

Well will be used for ☐ private supply ☒ public water supply ☐ irrigation ☐ industrial 25

☐ test well ☐ other ____

If this permit is for repair, modification or alteration of a well constructed under a previous permit give number ____ and indicate work to be done ____

If for modification of a pumping facility which will change quantity pumped indicate old pump ____ HP ____ GPM. new pump ____ HP ____ GPM.

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor H M Keane

Access to proposed well site for inspection at any reasonable time is hereby granted personnel of Southwest Florida Water Management District (Regulatory).

Signature of Owner or his Agent George J. Diaz

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY SBH

PERMIT TO CONSTRUCT A WELL 73-05389

20

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) 2, as described on the reverse side of this form, shall be required.

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: Seldred D Hughes Date 11-27-72

Title ____

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND

PROMINENTLY DISPLAYED

SWFWMD (R)
SF1710

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)
DRILLERS COMPLETION REPORT AND WELL LOG

TO: Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Permit Number B-07602
Well started – date 3-5-73
Well completed – date 3-10-73

Well owner: Name and Address RONNIE GILLIARD ZOLFO FLA

Well location: County HARDEE

36 33 25
SECTION, TOWNSHIP, RANGE

INDICATE WELL LOCATION IN THE SECTION

Tests taken: ☐bacterial ☐chemical ☒none
by: ☐County Health Department ☐other

CASING CONSTRUCTION
(CHECK ONE)
☐galvanized
☒black iron
☐other

(CHECK ONE)
☒threaded, coupled
☐T&C, welded
☐weld only
☐other

Casing diam. ins.
4 to ___ ft.
___ to ___ ft.
___ to ___ ft.
seated at 42 ft.
below land surface.

Purpose of well:
☒domestic ☐public water supply ☐irrigation ☐stock
☐industrial ☐other

Pump ___ HP. Type ___ ☐electric ☐diesel

Yield ___ GPM. ☒Well not pumped. ☐Well flows above land surface

Water level ~~above~~/below land surface before pumping 30 feet. Water level lowered to ___ feet after ___ minutes pumping at ___ GPM.

Method of drilling: ☐rotary ☒cable tool ☐jet ☐other

Finish: ☒open hole ☐sand point ☐well screen placed at ___ feet. and ___ feet. depth packer set ___ feet.

COLOR OF MATERIAL	CHARACTER OF MATERIAL (NOTE EACH TYPE OF MATERIAL AND CAVITIES IF ANY)	CHANGE	FORMATION FROM FT.	TO FT.
White	SAND		0	20
LIGHT GREEN	CLAY		20	38
White	Rock & HAWTHORNE		38	45
Gray	HAWTHORNE		45	80
White	ROCK		80	82
GRAY	HAWTHORNE		82	110
White	Lime SOFT		110	135
GRAY	LIME HARD		135	155
BROWN	LIME HARD		155	165

(USE CONTINUATION SHEET FOR LOG OF WELLS DEEPER THAN 300 FEET)

Well Completed By: Carl Douglas D188 (DRILLER'S SIGNATURE AND NUMBER) Douglas W.D. (FIRM NAME)

SWFWMD(R) SF1711

BEST AVAILABLE COPY

... FLORIDA ... ATER MANAGEMENT DISTRICT (REGULATORY)
APPLICA... N FOR A PERMIT TO CONST... T A WELL

To: Chief Hydrologist, SWFWMD(R)
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date 1-29-73

(TYPE OR USE BALLPOINT PEN AND PRESS HARD)

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

CARL DOUGLAS (DRILLING CONTRACTOR) F87 (NUMBER) 604 S. 8TH AVE. WAUCHULA (ADDRESS)

requests authorization to construct a well for RONALD GILLIARD (NAME OF WELL OWNER)

ADDRESS (MAILING) STREET OR BOX NO. CITY ZIP CODE

Well will be 4 inches in diameter. Proposed yield to be 30 GPM.

Well will be constructed with [X] cable tool [ ] rotary [ ] jetted [ ] other (specify)

Well will be approximately 200 feet deep. Well will have about 50 feet of casing

[X] black pipe [ ] galvanized [ ] other

Casing will be joined by [X] coupling [ ] weld [ ] both. Space between casing and hole will be sealed with:

[X] natural materials [ ] neat cement grout [ ] other

Well will be located at 36 33 25 (SECTION, TOWNSHIP, RANGE AND STREET ADDRESS) CITY HARDEE (COUNTY) 25

Well will be used for [X] private supply [ ] public water supply [ ] irrigation [ ] industrial

[ ] test well [ ] other

If this permit is for repair, modification or alteration of a well constructed under a previous permit give number ______ and indicate work to be done

If for modification of a pumping facility which will change quantity pumped indicate old pump ______ HP ______ GPM. new pump ______ HP ______ GPM.

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor Carl Douglas

Access to proposed well site for inspection at any reasonable time is hereby granted personnel of Southwest Florida Water Management District (Regulatory).

Signature of Owner or his Agent Ronald Gilliard

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL

73-07602

20

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ______ , as described on the reverse side of this form, shall be required.

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: [signature] Date 1-30-73

Title

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS.

PROMINENTLY DISPLAYED

SWFWMD (R)
SF1710

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)
DRILL. S COMPLETION REPORT AN. WELL LOG

20

TO: Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Permit Number 79-02603
Well started – date 2-15-79
Well completed – date 2-30-79

Well owner: Name and Address RONALD GILLIARD ZOLFO FLA.

Well location: County HARDEE
36 33 25
SECTION, TOWNSHIP, RANGE

INDICATE WELL LOCATION IN THE SECTION

Tests taken: ☐bacterial ☐chemical ☒none
by: ☐County Health Department
☐other

Purpose of well:
☒domestic ☐public water supply ☐irrigation ☐stock
☐industrial ☐other

Pump ______ HP. Type ______ ☐electric ☐diesel
Yield ______ GPM. ☒Well not pumped. ☐Well flows above land surface
Water level ~~above~~/below land surface before pumping 30 feet. Water level lowered to ______ feet after ______ minutes pumping at ______ GPM.

Method of drilling: ☐rotary ☒cable tool ☐jet ☐other
Finish: ☒open hole ☐sand point ☐well screen placed at ______ feet. and ______ feet.
depth packer set ______ feet.

CASING CONSTRUCTION
(CHECK ONE)
☐galvanized
☒black iron
☐other

(CHECK ONE)
☒threaded, coupled
☐T&C, welded
☐weld only
☐other

Casing diam. ins.
4 to ______ ft.
______ to ______ ft.
______ to ______ ft.
seated at 49 ft. below land surface.

COLOR OF MATERIAL	CHARACTER OF MATERIAL (NOTE EACH TYPE OF MATERIAL AND CAVITIES IF ANY)	FORMATION CHANGE	FROM FT.	TO FT.
White	SAND		0	20
Light Green	CLAY		20	38
White	Rock + Hawthorne		38	45
Gray	Hawthorne		45	80
White	Rock		80	82
Gray	Hawthorne		82	110
White	Lime Soft		110	135
Gray	Lime Hard		135	155
Brown	Lime Hard		155	165

(USE CONTINUATION SHEET FOR LOG OF WELLS DEEPER THAN 300 FEET)

Well Completed By: Carl Douglas D188 — DRILLER'S SIGNATURE AND NUMBER
Douglas W.D. — FIRM NAME

SWFWMD(R) 5F1711

BEST AVAILABLE COPY

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)
APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

To: Chief Hydrologist, SWFWMD(R)
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date: 1-29-73

(TYPE OR USE BALLPOINT PEN AND PRESS HARD)

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

CARL DOUGLAS (DRILLING CONTRACTOR) F-87 (NUMBER) 604 S. 8TH AVE (ADDRESS)

requests authorization to construct a well for RONALD GILLIARD (NAME OF WELL OWNER)

ADDRESS (MAILING) STREET OR BOX NO. CITY ZIP CODE

Well will be 4 inches in diameter. Proposed yield to be 30 GPM.

Well will be constructed with ☒ cable tool ☐ rotary ☐ jetted ☐ other (specify) ____

Well will be approximately 870 feet deep. Well will have about 60 feet of casing

☒ black pipe ☐ galvanized ☐ other ____

Casing will be joined by ☒ coupling ☐ weld ☐ both. Space between casing and hole will be sealed with:

☒ natural materials ☐ neat cement grout ☐ other ____

Well will be located at 36 33 25 (SECTION, TOWNSHIP, RANGE AND STREET ADDRESS) CITY HARDEE (COUNTY) 25

Well will be used for ☒ private supply ☐ public water supply ☐ irrigation ☐ industrial

☐ test well ☐ other ____

If this permit is for repair, modification or alteration of a well constructed under a previous permit give number ____ and indicate work to be done ____

If for modification of a pumping facility which will change quantity pumped indicate old pump ____ HP ____ GPM. new pump ____ HP ____ GPM

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor: Carl Douglas

Access to proposed well site for inspection at any reasonable time is hereby granted personnel of Southwest Florida Water Management District (Regulatory).

Signature of Owner or his Agent: Ronald Gilliard

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL 73-00603 20

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ____ , as described on the reverse side of this form, shall be required

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: [signature] Date 1-30-73

Title ____

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS

PROMINENTLY DISPLAYED

SWFWMD(R)
SF1718

STATE OF [FLO]RIDA

WATER WELL CONTRACTOR'S NOTIFICATION OF CONSTRUCTION OR REPAIR OF A WATER WELL

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
506 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-8476

Form 747353-28

Owner's Well Identification

№ 5466

1. OWNER: RONALD GILLIARD
Name
WAUCHULA FLA
Address City State

2. LOCATION OF WELL: LAKE DALE ROAD
Street Address/Road
WAUCHULA HARDEE 25
City County
Subdivision Lot No.
36 33 25
Section Township Range

3. PURPOSE OF WELL:
☒ Domestic ☐ Irrigation ☐ Public Supply
☐ Industrial ☐ Stock ☐ Other

4. TYPE OF WORK:
☒ New Well ☐ Plugging ☐ Other
☐ Deepening ☐ Reconditioning

5. QUALITY:
☐ Clear ☐ Colored ☒ Sulfur ☐ Salty ☐ Other

CHECK TEST MADE
☒ None
☐ Bacteria
☐ Chemical
Chloride ___ PPM
(Check ☐ if test was for sodium chloride)
Temperature ___ °F
Well Disinfected ☒ Yes ☐ No

Test By:
☒ County Health Dept.
☐ State Health Dept.
☐ U.S.G.S.
☐ Other ___
Name
Address

6. EQUIPMENT:
☐ Rotary ☒ Cable Tool ☐ Other
☐ Jet ☐ Reverse Rotary

7. GROUT: ☐ None ☐ Cement ☐ Other

Describe and give number of bags (94 lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches) Kind	From (ft)	To (ft)
4" BLACK, T&C	0	80

(Check One) ☒ Threaded & Coupled ☐ Welded Only
☐ T & C & Welded ☐ Other

9. WATER LEVEL:
Water level after well completed 40 feet
☐ Above ☒ Below land surface
Well Flowing: ☐ Yes ☒ No Flow ___ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)

11. UPPER END OF WELL:
☒ Pump Installed ☐ Valve ☐ Cap ☐ Other

12. PUMPING TEST:
Date ___ ☐ Test Pump ☐ Permanent Pump
Measure point is ___
which is ___ feet ☐ above ☐ below land surface
Static water level ___ feet ☐ above ☐ below measure point
Maximum Drawdown ___ feet below measure point
Discharge at maximum drawdown ___ gal/min
After ___ hours

13. PUMP INSTALLED:
Type ___ Make SEARS Model No. ___
Motor Power SEA Make SEARS H.P. ½
Capacity ___ Gal/min at ___ ft. of total dynamic head
No. of bowls or stages ___
Pump setting 50 feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 10 foot intervals and at changes.
	0'	30'	SAND BROWN,
	30'	49'	CLAY GREEN
	49'	52	ROCK, WHITE.
	52'	80'	CLAY GRAY
	80	130	ROCK, WHITE
	130	158	LIME BROWN
			158' BOTTOM OF HOLE,

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on 5-28-74 and was completed on 5-30-74

DOUGLAS WD 1065
Contractor License Number
Carl Douglas BOX S 8 B
Signature of Representative P.O. box or Street
WAUCHULA HARDEE FLA
City County State
7734615 Carl Douglas
Phone Number Driller

BEST AVAILABLE COPY

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)
APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

To Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date Jan 18-74

TYPE OR USE BALLPOINT PEN AND PRESS HARD
In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

Douglas W.D. 1065 604 S 3rd Wauchula FLA
DRILLING CONTRACTOR NUMBER ADDRESS

requests authorization to construct a well for Ronnie Gilliard
NAME OF WELL OWNER

Wauchula FLA 33873
ADDRESS (MAILING) STREET OR BOX NO. CITY

Well will be 4 inches in diameter. Proposed yield to be 30 GPM.

Well will be constructed with ☒ cable tool ☐ rotary ☐ jetted ☐ other (specify) ________

Well will be approximately 160 feet deep. Well will have about 40-50 feet of casing

☒ black pipe ☐ galvanized ☐ other ________.

Casing will be joined by ☒ coupling ☐ weld ☐ both. Space between casing and hole will be sealed with:

☒ natural materials ☐ neat cement grout ☐ other ________.

Well will be located X36 33 S 25 E Hardee
SECTION TOWNSHIP RANGE AND STREET ADDRESS CITY COUNTY

25

Well will be used for ☒ private supply ☐ public water supply ☐ irrigation ☐ industrial

☐ test well ☐ other New Home.

If this permit is for repair, modification or alteration of a well constructed under a previous permit give number

________ and indicate work to be done ________

If for modification of a pumping facility which will change quantity pumped indicate old pump ______ HP

______ GPM new pump ______ HP ______ GPM

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor Carl Douglas

Access to proposed well site for inspection at any reasonable time is hereby granted personnel of Southwest Florida Water Management District (Regulatory).

Signature of Owner or his Agent Ronald Gilliard

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL 74-9355-20

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ______, as described on the reverse side of this form, shall be required.

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: [signature] Date 1-21-74

Title ________

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS.

PROMINENTLY DISPLAYED

SWFWMD(R)
SF 17C

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION
OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
505 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-8476

Permit No. 74-13042-20

Owner's Well Identification

Nº 24523

For Department Use ONLY — State Well Number

1. OWNER: RONALD GILLIARD
Name
ZOLFO BLD. CONT. FLA
Address City State

2. LOCATION OF WELL: LAKE DALE
Street Address/Road
HARDEE
City County
Subdivision Lot No.
36 33 25
Section Township Range

3. PURPOSE OF WELL:
X Domestic Irrigation Public Supply
Industrial Stock Other

4. TYPE OF WORK:
X New Well Plugging Other
Deepening Reconditioning

5. QUALITY
X Clear Colored Sulfur Salty Other

CHECK TEST MADE
X None
Bacteria
Chemical
Chloride ____ PPM
(Check __ if test was for sodium chloride)
Test By:
County Health Dept.
State Health Dept.
U.S.G.S.
Other
Name
Address
Temperature 68 °F
Well Disinfected X Yes No

6. EQUIPMENT:
Rotary X Cable Tool Other
Jet Reverse Rotary

7. GROUT: X None Cement Other

Describe and give number of bags (94 lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4		0	50

(Check One) X Threaded & Coupled Welded Only
T & C & Welded Other

9. WATER LEVEL:
Water level after well completed 50 feet
Above X below land surface
Well Flowing: Yes X No Flow ____ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)

11. UPPER END OF WELL:
X Pump Installed Valve Cap Other

12. PUMPING TEST: Test Pump Permanent Pump
Date
Measure point is ____
which is ____ feet above below land surface
Static water level ____ feet above below measure point
Maximum Drawdown ____ feet below measure point
Discharge at maximum drawdown ____ gal/min
After ____ hours

13. PUMP INSTALLED:
Type SUB Make SEARS Model No.
Motor Power ELEC Make ____ H.P. 1/2
Capacity ____ Gal/min at ____ ft. of total dynamic head
No. of bowls or stages
Pump setting 84 feet

14. WELL LOG:

Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.

Well bore (in)	Depth (feet) From	To	
4	0	32	SAND YELLOW
	32	49	CLAY "
	49	54	ROCK. GRAY
	54	84	CLAY GRAY
	84	86	ROCK. WHITE
	86	130	CLAY GRAY WITH BLACK PEEBLES
	130	160	ROCK BROWN

BOTTOM OF HOLE 160'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on 10-1-74 and was completed on 11-20-74

DOUGLAS W.D. 1065
Contractor License Number
Carl Douglas 604 S 8th
Signature of Representative P.O. Box or Street
WAUCHULA HARDEE FLA
City County State
7734615 Carl Douglas
Phone Number Driller

FORM: DNR/SW-2

SOUTHWEST FLOR A WATER MANAGEMENT DIS ICT (REGULATORY)
APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

ief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date 6-20-74

(USE BALL POINT PEN AND PRESS HARD)
In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

DOUGLAS WD — 1065 — 604 S 8th WAUCHULA FLA 33873
DRILLING CONTRACTOR — NUMBER — ADDRESS

requests authorization to construct a well for RONALD GILLIARD
NAME OF WELL OWNER

ADDRESS (MAILING) ZOLFO BLD CONT
STREET OR BOX NO. — CITY — ZIP CODE

Well will be 4 inches in diameter. Proposed yield to be 20 GPM.

Well will be constructed with X cable tool [ ] rotary [ ] jetted [ ] other (specify) ______

Well will be approximately 160 feet deep. Well will have about 50 feet of casing

X black pipe [ ] galvanized [ ] other ______

Casing will be joined by X coupling [ ] weld [ ] both. Space between casing and hole will be sealed with:

X natural materials [ ] neat cement grout [ ] other ______

Well will be located at 36 33 25 — HARDEE
SECTION, TOWNSHIP, RANGE AND STREET ADDRESS — CITY — COUNTY

Well will be used for: X private supply [ ] public water supply [ ] irrigation [ ] industrial

[ ] test well other ______

If this permit is for repair, modification or alteration of a well constructed under a pervious permit give number

______ and indicate work to be done ______

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor Carl Douglas

I hereby consent to be regulated by Southwest Florida Water Management District and by Southwest Florida Water Management District (Regulatory) regarding consumptive use of water and allocation thereof, and if this permit is granted I agree to comply with the conditions set forth on the reverse side of this form. Access to proposed well site for inspection at any reasonable time is hereby granted personnel of SWFWMD and SWFWMD(R).

Signature of Owner or his authorized Agent Ronald Gilliard

DO NOT WRITE BELOW THIS LINE — — FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL 20

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and subject to conditions set forth on the reverse side of this form permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ______, as described on the reverse side of this form, shall be required.

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: [signature] Date 6-27-74

Title ______

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS,

PROMINENTLY DISPLAYED

SWFWMD(R)
SF 1710 REV. 1/2/74

BEST AVAILABLE COPY

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
505 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-8476

Pe No. 74-13043-20
Owner's Well Identification
№ 5429

For Department Use ONLY — State Well Number

1. OWNER: RONALD GILLIARD (Name)
2CLEC BLD CONT FLA. (Address, City, State)

2. LOCATION OF WELL: LAKEDALE RD. (Street Address/Road)
HARDEE (County)
City
Subdivision — Lot No.
26 (Section) 33 (Township) 25 (Range)

3. PURPOSE OF WELL: X Domestic; Industrial; Irrigation; Stock; Public Supply; Other

4. TYPE OF WORK: X New Well; Deepening; Plugging; Reconditioning; Other

5. QUALITY: X Clear; Colored; Sulfur; Salty; Other

CHECK TEST MADE: X None; Bacteria; Chemical; Chloride ___ PPM (Check if test was for sodium chloride)
Test By: County Health Dept.; State Health Dept.; U.S.G.S.; Other — Name — Address
Temperature 60
Well Disinfected X Yes No

6. EQUIPMENT: Rotary; Jet; X Cable Tool; Reverse Rotary; Other

7. GROUT: X None; Cement; Other
Describe and give number of bags (94 lb.) — From (ft) — To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4		0	52

(Check One) Threaded & Coupled; Welded Only; T & C & Welded; Other

9. WATER LEVEL
Water level after well completed 52 feet
Above; X Below land surface
Well Flowing: Yes X No — Flow ___ gal/min

10. SCREENS

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)

11. UPPER END OF WELL: X Pump Installed; Valve; Cap; Other

12. PUMPING TEST: Date ___ Test Pump; Permanent Pump
Measure point is ___
which is ___ feet above / below land surface
Static water level ___ feet above / below measure point
Maximum Drawdown ___ feet below measure point
Discharge at maximum drawdown ___ gal/min
After ___ hours

13. PUMP INSTALLED:
Type SFA Make SEARS Model No.
Motor Power ELEC Make ✓ H.P. ½
Capacity ___ Gal/min at ___ ft. of total dynamic head
No. of bowls or stages ___
Pump setting 84 feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	32	SAND YELLOW
	32	51	CLAY + ROCK. YELLOW
	51	54	ROCK, GRAY
	54	80	CLAY GRAY
	80	82	ROCK GRAY
	82	130	CLAY GRAY
	130	170	ROCK, BROWN

BOTTOM OF HOLE 170'

✓

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on 10-1-74 and was completed on 11-10-74

DOUGLAS W.D. (Contractor) 1065 (License Number)
Carl Douglas (Signature of Representative) 604 S 8th (P.O. Box or Street)
WAUCHULA (City) HARDEE (County) FLA (State)
7734615 (Phone Number) Carl Douglas (Driller)

FORM: DNR/BW-1

SOUTHWEST FLOR A WATER MANAGEMENT DIS' 'CT (REGULATORY)
APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date 6-20-74

(USE BALL POINT PEN AND PRESS HARD)

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

DOUGLAS WD (DRILLING CONTRACTOR) 1065 (NUMBER) 604 S 8th WAUCHULA FLA. 33873 (ADDRESS)

requests authorization to construct a well for RONALD GILLIARD (NAME OF WELL OWNER)

ADDRESS: ZOLFO BLD CONT. (MAILING: STREET OR BOX NO.) ________ (CITY) ________ (ZIP CODE)

Well will be 4 inches in diameter. Proposed yield to be 20 GPM.

Well will be constructed with X cable tool ☐ rotary ☐ jetted ☐ other (specify) ________

Well will be approximately 160 feet deep. Well will have about 50 feet of casing

X black pipe ☐ galvanized ☐ other ________

Casing will be joined by X coupling ☐ weld ☐ both. Space between casing and hole will be sealed with:

X natural materials ☐ neat cement grout ☐ other ________

Well will be located at 36 33 25 (SECTION, TOWNSHIP, RANGE AND STREET ADDRESS) ________ (CITY) HARDEE (COUNTY)

Well will be used for: X private supply ☐ public water supply ☐ irrigation ☐ industrial

☐ test well other ________

If this permit is for repair, modification or alteration of a well constructed under a pervious permit give number ________ and indicate work to be done ________

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor Carl Douglas

I hereby consent to be regulated by Southwest Florida Water Management District and by Southwest Florida Water Management District (Regulatory) regarding consumptive use of water and allocation thereof, and if this permit is granted I agree to comply with the conditions set forth on the reverse side of this form. Access to proposed well site for inspection at any reasonable time is hereby granted personnel of SWFWMD and SWFWMD(R).

Signature of Owner or his authorized Agent Ronald Gilliard

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and subject to conditions set forth on the reverse side of this form permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ________, as described on the reverse side of this form, shall be required.

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: [signature] Date 6-27-74

Title ________

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS,

PROMINENTLY DISPLAYED

STATE O[illegible] [illegible]LORIDA

WATER WELL CONTRACTOR'S NOTIFICATION OF CONSTRUCITON OR REPAIR OF A WATER WELL

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF INTERIOR RESOURCES

505 Larson Building, Tallahassee, Florida 32304

Telephone: (904) 488-8476

Permit No. 74-18045-20

Owner's Well Identification

Nº 5430

For Department Use ONLY — State Well Number

1. OWNER: BONALD GILLIARD (Name)
ZOLFOBLD CONT FLA (Address, City, State)

2. LOCATION OF WELL: LAKE DALE RD (Street Address/Road)
City — HARDEE (County)
Subdivision — Lot No.
36 (Section) 33 (Township) 25 (Range)

3. PURPOSE OF WELL: X Domestic, Irrigation, Public Supply, Industrial, Stock, Other

4. TYPE OF WORK: X New Well, Plugging, Other, Deepening, Reconditioning

5. QUALITY: X Clear, Colored, Sulfur, Salty, Other

CHECK TEST MADE
None, Bacteria, Chemical, Chloride ___ PPM (Check if test was for sodium chloride)
Test By: County Health Dept., State Health Dept., U.S.G.S., Other
Name
Address
Temperature 73 °F
Well Disinfected X Yes No

6. EQUIPMENT: Rotary, Jet, X Cable Tool, Reverse Rotary, Other

7. GROUT: X None, Cement, Other

Describe and give number of bags (94 lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4		0	50

(Check One) X Threaded & Coupled, Welded Only, T & C & Welded, Other

9. WATER LEVEL:
Water level after well completed 48 feet
Above, X below land surface
Well Flowing: Yes, No Flow ___ gal/min

10. SCREENS

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)

11. UPPER END OF WELL: X Pump Installed, Valve, Cap, Other

12. PUMPING TEST
Date ___ Test Pump, Permanent Pump
Measure point is
which is ___ feet above, below land surface
Static water level ___ feet above, below measure point
Maximum Drawdown ___ feet below measure point
Discharge at maximum drawdown ___ gal/min
After ___ hours

13. PUMP INSTALLED:
Type SUB Make SEARS Model No.
Motor Power ELEC Make ___ H.P. ½
Capacity ___ Gal/min at ___ ft. of total dynamic head
No. of bowls or stages
Pump setting 84 feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	40	SAND YELLOW
	40	49	CLAY GRAY
	49	51	ROCK, GRAY
	51	82	CLAY GRAY
	82	84	ROCK WHITE
	84	120	CLAY GRAY
	120	135	ROCK GRAY
	135	175	ROCK BROWN
			BOTTOM OF HOLE 175'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on 10-30-74 and was completed on 11-1-74

DOUGLAS WD (Contractor) 1065 (License Number)
Carl Douglas (Signature of Representative) 604 58th (P.O. Box or Street)
WAUCHULA (City) HARDEE (County) FLA (State)
7734615 (Phone Number) Carl Douglas (Driller)

BEST AVAILABLE COPY

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)
APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

To: Chief Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date 6-20-74

(PLEASE USE BALL-POINT PEN AND PRESS HARD)

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

DOUGLAS WD (DRILLING CONTRACTOR) 1065 (NUMBER) 604 S 8th WAUCHULA FLA 33873 (ADDRESS)

requests authorization to construct a well for RONALD GILLIARD (NAME OF WELL OWNER)

Address ZOLFO BLD. CONT. (MAILING STREET OR BOX NO.) (CITY) (ZIP CODE)

Well will be 4 inches in diameter. Proposed yield to be 20 GPM.

Well will be constructed with X cable tool ☐ rotary ☐ jetted ☐ other (specify) ____

Well will be approximately 160 feet deep. Well will have about 50 feet of casing

X black pipe ☐ galvanized ☐ other ____

Casing will be joined by X coupling ☐ weld ☐ both. Space between casing and hole will be sealed with:

X natural materials ☐ neat cement grout ☐ other ____

Well will be located at 36 33 25 (SECTION, TOWNSHIP, RANGE AND STREET ADDRESS) (CITY) HARDEE (COUNTY)

Well will be used for: X private supply ☐ public water supply ☐ irrigation ☐ industrial

☐ test well ☐ other ____

If this permit is for repair, modification or alteration of a well constructed under a pervious permit give number ____ and indicate work to be done ____

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor Carl Douglas

I hereby consent to be regulated by Southwest Florida Water Management District and by Southwest Florida Water Management District (Regulatory) regarding consumptive use of water and allocation thereof, and if this permit is granted I agree to comply with the conditions set forth on the reverse side of this form. Access to proposed well site for inspection at any reasonable time is hereby granted personnel of SWFWMD and SWFWMD(R).

Signature of Owner or his authorized Agent Ronald Gilliard

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL

- -20

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and subject to conditions set forth on the reverse side of this form permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ____, as described on the reverse side of this form, shall be required.

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: [signature] Date 6-27-74

Title ____

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS,

PROMINENTLY DISPLAYED

SWFWMD R
SF 1110 REV. 1/2/74

STATE C[illegible] [illegible]LORIDA
WATER WELL CONTRACTOR'S NOTIFICATION
OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
505 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-8476

Pe. No 74-13046-20

Owner's Well Identification

№ 24524

State Well Number — For Department Use ONLY

1. OWNER: BONALD RILLARD (Name)
ZOLFC RLD CONT FLA (Address, City, State)

2. LOCATION OF WELL: LAKEDALE RD. (Street Address/Road)
City — County: HARDEE
Subdivision — Lot No.
Section 36 Township 33 Range 25

3. PURPOSE OF WELL: [X] Domestic Industrial Irrigation Stock [ ] Public Supply [ ] Other

4. TYPE OF WORK: [X] New Well Deepening Plugging Reconditioning [ ] Other

5. QUALITY: [X] Clear [ ] Colored [ ] Sulfur [ ] Salty [ ] Other

CHECK TEST MADE
[X] None Bacteria Chemical
Chloride ___ PPM
(Check [ ] if test was for sodium chloride)
Test By: [ ] County Health Dept. [ ] State Health Dept. [ ] U.S.G.S. [ ] Other
Name
Address
Temperature 66°
Well Disinfected [X] Yes [ ] No

6. EQUIPMENT: Rotary Jet [X] Cable Tool [ ] Reverse Rotary [ ] Other

7. GROUT: [X] None [ ] Cement [ ] Other

Describe and give number of bags (94 lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4		0	51

(Check One) Threaded & Coupled [ ] Welded Only T & C & Welded [ ] Other

9. WATER LEVEL:
Water level after well completed 50 feet
Above [X] Below land surface
Well Flowing: Yes [ ] No Flow ___ gal/min

10. SCREENS.

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)

11. UPPER END OF WELL: [X] Pump Installed [ ] Valve [ ] Cap [ ] Other

12. PUMPING TEST: Date ___ [ ] Test Pump [ ] Permanent Pump
Measure point is ___
which is ___ feet [ ] above [ ] below land surface
Static water level ___ feet [ ] above [ ] below measure point
Maximum Drawdown ___ feet below measure point
Discharge at maximum drawdown ___ gal/min
After ___ hours

13. PUMP INSTALLED:
Type SUB Make SEARS Model No.
Motor Power ___ Make ___ H.P. 1/2
Capacity ___ Gal/min at ___ ft. of total dynamic head
No. of bowls or stages
Pump setting 84 feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	32	SAND YELLOW
	32	50	CLAY & SAND GRAY
	50	52	ROCK, GRAY
	52	80	CLAY GRAY
	80	86	ROCK, GRAY
	86	130	CLAY GRAY
	130	155	ROCK, BROWN
			BOTTOM OF HOLE 155'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on 10-30-74 and was completed on 11-10-74

DOUGLAS WD — 1065
Contractor — License Number
Carl Douglas — 604 5th
Signature of Representative — P.O. Box or Street
WAUCHULA HARDEE FLA
City — County — State
7734615 — Carl Douglas
Phone Number — Driller

FORM: DNR/BW-2

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)
APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date 6-20-74

PLEASE USE BALL POINT PEN AND PRESS HARD!

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

DOUGLAS WD — DRILLING CONTRACTOR 1065 — NUMBER 604 S 8th WAUCHULA FLA 33873 — ADDRESS

requests authorization to construct a well for RONALD GILLIARD — NAME OF WELL OWNER

ADDRESS ZOLFO BLD CONT. — MAILING STREET OR BOX NO. — CITY — ZIP CODE

Well will be 4 inches in diameter. Proposed yield to be 20 GPM.

Well will be constructed with X cable tool ☐ rotary ☐ jetted ☐ other (specify) ____

Well will be approximately 160 feet deep. Well will have about 50 feet of casing

X black pipe ☐ galvanized ☐ other ____

Casing will be joined by X coupling ☐ weld ☐ both. Space between casing and hole will be sealed with:

X natural materials ☐ neat cement grout ☐ other ____

Well will be located at 36 33 25 — SECTION, TOWNSHIP, RANGE AND STREET ADDRESS — CITY HARDEE — COUNTY

Well will be used for: X private supply ☐ public water supply ☐ irrigation ☐ industrial

☐ test well ☐ other ____

If this permit is for repair, modification or alteration of a well constructed under a pervious permit give number ____ and indicate work to be done ____

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor Carl Douglas

I hereby consent to be regulated by Southwest Florida Water Management District and by Southwest Florida Water Management District (Regulatory) regarding consumptive use of water and allocation thereof, and if this permit is granted I agree to comply with the conditions set forth on the reverse side of this form. Access to proposed well site for inspection at any reasonable time is hereby granted personnel of SWFWMD and SWFWMD(R).

Signature of Owner or his authorized Agent Ronald Gilliard

DO NOT WRITE BELOW THIS LINE — FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and subject to conditions set forth on the reverse side of this form permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ____, as described on the reverse side of this form, shall be required.

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: [illegible signature] Date 6-27-74

Title ____

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS.

PROMINENTLY DISPLAYED

SWFWMD R
SF 1710 REV. 1/2/74

BEST AVAILABLE COPY

STATE C LORIDA
WATER WELL CONTRACTOR'S NOTIFICATION
OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
505 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-8476

Per. No. 74-13047-20

Owner's Well Identification

№ 5445

For Department Use ONLY — State Well Number

1. OWNER: RONALD GILLIARD
Name / Address: ZOLFO / City: BLD CONT / State: FLA

2. LOCATION OF WELL: LAKEDALE RD.
Street Address/Road
City / County: HARDEE
Subdivision / Lot No.
Section 36 / Township 33 / Range 25

3. PURPOSE OF WELL: X Domestic / Industrial / Irrigation / Stock / Public Supply / Other

4. TYPE OF WORK: X New Well / Deepening / Plugging / Reconditioning / Other

5. QUALITY: X Clear / Colored / Sulfur / Salty / Other
CHECK TEST MADE
None / Bacteria / Chemical / Chloride ___ PPM (Check if test was for sodium chloride)
Test By: County Health Dept. / State Health Dept. / U.S.G.S. / Other
Name / Address
Temperature 66
Well Disinfected X Yes No

6. EQUIPMENT: Rotary / Jet / X Cable Tool / Reverse Rotary / Other

7. GROUT: X None / Cement / Other
Describe and give number of bags (94 lb.) / From (ft) / To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4		0	50

(Check One) X Threaded & Coupled / Welded Only / T & C & Welded / Other

9. WATER LEVEL: Water level after well completed 50 feet
Above X below land surface
Well Flowing Yes X No Flow ___ gal/min

10. SCREENS

Make	Materials	Diameter	Slot Size	Location (ft) Below Surface From (ft)	To (ft)

11. UPPER END OF WELL: X Pump Installed / Valve / Cap / Other

12. PUMPING TEST
Date ___ Test Pump / Permanent Pump
Measure point is ___
which is ___ feet above / below land surface
Static water level ___ feet above / below measure point
Maximum Drawdown ___ feet below measure point
Discharge at maximum drawdown ___ gal/min
After ___ hours

13. PUMP INSTALLED:
Type SUB Make SEARS Model No.
Motor Power ELEC Make ___ H.P. 1/2
Capacity ___ Gal/min at ___ ft. of total dynamic head
No. of bowls or stages
Pump setting 84 feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	32	SAND YELLOW
	32	34	SANDSTONE GRAY
	34	49	CLAY + SAND GRAY
	49	51	ROCK GRAY
	51	84	CLAY "
	84	86	ROCK WHITE
	86	128	CLAY GRAY
	128	160	ROCK BROWN
			BOTTOM OF HOLE 160'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on 10-15-74 and was completed on 11-30-74

DOUGLAS WD 1065
Contractor / License Number
Carl Douglas 604 S 8th
Signature of Representative / P.O. Box or Street
WAUCHULA HARDEE FLA
City / County / State
773-4615 Carl Douglas
Phone Number / Driller

FORM: DNR/SW-3

SOUTHWEST FLOR A WATER MANAGEMENT DIS CT (REGULATORY)

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date 6-20-74

... USE BALL POINT PEN AND PRESS HARD!

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

DOUGLAS W.D. (DRILLING CONTRACTOR) 1065 (NUMBER) 604S 8th WAUCHULA FLA 33873 (ADDRESS)

requests authorization to construct a well for RONALD GILLIARD (NAME OF WELL OWNER)

ADDRESS ZOLFO BLD. CONT. (MAILING) (STREET OR BOX NO.) (CITY) (ZIP CODE)

Well will be 4 inches in diameter. Proposed yield to be 20 GPM.

Well will be constructed with X cable tool rotary jetted other (specify)

Well will be approximately 160 feet deep. Well will have about 50 feet of casing

X black pipe galvanized other

Casing will be joined by X coupling weld both. Space between casing and hole will be sealed with:

X natural materials neat cement grout other

Well will be located at 36 33 25 (SECTION, TOWNSHIP, RANGE AND STREET ADDRESS) (CITY) HARDEE (COUNTY)

Well will be used for: X private supply public water supply irrigation industrial

test well other

If this permit is for repair, modification or alteration of a well constructed under a pervious permit give number ______ and indicate work to be done

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor Carl Douglas

I hereby consent to be regulated by Southwest Florida Water Management District and by Southwest Florida Water Management District (Regulatory) regarding consumptive use of water and allocation thereof, and if this permit is granted I agree to comply with the conditions set forth on the reverse side of this form. Access to proposed well site for inspection at any reasonable time is hereby granted personnel of SWFWMD and SWFWMD(R).

Signature of Owner or his authorized Agent X Ronald Gilliard

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and subject to conditions set forth on the reverse side of this form permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ______, as described on the reverse side of this form, shall be required.

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: [illegible signature] Date 6-27-74

Title

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS,

PROMINENTLY DISPLAYED

SWFWMD R
SF 1710 REV. 1/2/74

STATE C[illegible]L[illegible]IDA

WATER WELL CONTRACTOR'S NOTIFICATION
OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
505 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-8476

Per. No. 14-13048-20

Owner's Well Identification

№ 5426

For Department Use ONLY — State Well Number

1. OWNER Ronnie Gilliard
Name
WAUCHULA FLA
Address City State

2. LOCATION OF WELL: LAKEDALE ROAD
Street Address/Road
WAUCHULA HARDEE
City County

Subdivision Lot No.
36 33 26
Section Township Range

3. PURPOSE OF WELL
X Domestic Irrigation Public Supply
Industrial Stock Other

4. TYPE OF WORK
X New Well Plugging Other
Deepening Reconditioning

5. QUALITY
X Clear Colored Sulfur Salty Other

CHECK TEST MADE
X None Test By:
Bacteria County Health Dept.
Chemical State Health Dept.
Chloride PPM U.S.G.S.
(Check if test was for sodium chloride) Other
Name
Temperature
Address
Well Disinfected X Yes No

6. EQUIPMENT:
Rotary X Cable Tool Other
Jet Reverse Rotary

7. GROUT X None Cement Other
Describe and give number of bags (94)lb.) From (ft) To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4	BLACK T.C.	0	42'

(Check One) X Threaded & Coupled Welded Only
T & C & Welded Other

9. WATER LEVEL:
Water level after well completed 50 feet
Above X below land surface
Well Flowing: Yes X No Flow gal/min

10. SCREENS

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)

11. UPPER END OF WELL:
X Pump installed Valve Cap Other

12. PUMPING TEST
Date Test Pump Permanent Pump
Measure point is
which is feet above below land surface
Static water level feet above below measure point
Maximum Drawdown feet below measure point
Discharge at maximum drawdown gal/min
after hours

13. PUMP INSTALLED:
Type Make Model No.
Motor Power Make H.P.
Capacity Gal/min at ft. of total dynamic head
No. of bowls or stages
Pump setting feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4			
	42	45	White Clay w/ black rock
	45'	51'	Gray Clay w/ black rock
	51'	56'	Gray rock
	56'	60'	Gray Clay w/ black speck
	60'	66'	White rock w/ black specks
	66'	92'	White Clay w/ black specks
	92'	101'	White rock w/ black spec
	101'	115'	Gray Clay w/ black spec
	115'	125'	White rock w/ black spec
	125'	165'	Brown lime w/ black spec

165' BOTTOM OF HOLE.

15. CONTRACTOR'S CERTIFICATION:

This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on 9-30-74 and was completed on 9-30-74

DOUGLAS WD. 1065
Contractor License Number
Carl Douglas 604 S 8th
Signature of Representative P.O. Box or Street
WAUCHULA HARDEE FLA
City County State
7734815 Carl Douglas
Phone Number Driller

BEST AVAILABLE COPY

SOUTHWEST FLOR A WATER MANAGEMENT DIS CT (REGULATORY)
APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date 6-20-74

TYPE OR USE BALL POINT PEN AND PRESS HARD!

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

DOUGLAS WD (DRILLING CONTRACTOR) 1065 (NUMBER) 604S 8th WAUCHULA FLA 33873 (ADDRESS)

requests authorization to construct a well for RONALD GILLIARD (NAME OF WELL OWNER)

ADDRESS (MAILING) ZOLFO BLD CONT. (STREET OR BOX NO.) (CITY) (ZIP CODE)

Well will be 4 inches in diameter. Proposed yield to be 20 GPM.

Well will be constructed with X cable tool ☐ rotary ☐ jetted ☐ other (specify) ____

Well will be approximately 160 feet deep. Well will have about 50 feet of casing

X black pipe ☐ galvanized ☐ other ____

Casing will be joined by X coupling ☐ weld ☐ both. Space between casing and hole will be sealed with:

X natural materials ☐ neat cement grout ☐ other ____

Well will be located at X 36 33 25 (SECTION, TOWNSHIP, RANGE AND STREET ADDRESS) (CITY) HARDEE (COUNTY)

Well will be used for: X private supply ☐ public water supply ☐ irrigation ☐ industrial

☐ test well other ____

If this permit is for repair, modification or alteration of a well constructed under a pervious permit give number

____ and indicate work to be done ____

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor Carl Douglas

I hereby consent to be regulated by Southwest Florida Water Management District and by Southwest Florida Water Management District (Regulatory) regarding consumptive use of water and allocation thereof, and if this permit is granted I agree to comply with the conditions set forth on the reverse side of this form. Access to proposed well site for inspection at any reasonable time is hereby granted personnel of SWFWMD and SWFWMD(R).

Signature of Owner or his authorized Agent Ronald Gilliard

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL 142-10

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and subject to conditions set forth on the reverse side of this form permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ____, as described on the reverse side of this form, shall be required.

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: [signature] Date 6-27-74

Title ____

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS,

PROMINENTLY DISPLAYED

SWFWMD R
SF 1710 REV. 1/2/74

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION
OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
505 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-8476

Permit No. 74-13049 20

Owner's Well Identification

№ 5424

For Department Use ONLY

State Well Number

1. OWNER Ronnie Gilliard
Name
WAUCHULA FLA
Address City State

2. LOCATION OF WELL LAKE DALE RD
Street Address/Road
HARDEE
City County

Subdivision Lot No.
36 33 25
Section Township Range

3. PURPOSE OF WELL:
X Domestic Irrigation Public Supply
Industrial Stock Other

4. TYPE OF WORK
X New Well Plugging Other
Deepening Reconditioning

5. QUALITY
X Clear Colored Sulfur Salty Other

CHECK TEST MADE
X None Test By:
Bacteria County Health Dept.
Chemical State Health Dept.
Chloride ___ PPM U.S.G.S.
(Check if test was for medium chloride) Other
Name
Temperature
Address
Well Disinfected X Yes No

6. EQUIPMENT
Rotary X Cable Tool Other
Jet Reverse Rotary

7. GROUT X None Cement Other

Describe and give number of bags (94)lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4"	BLACK T&C	0	42

(Check One) X Threaded & Coupled Welded Only
T & C & Welded Other

9. WATER LEVEL
Water level after well completed 40 feet
Above X below land surface
Well Flowing: Yes X No Flow ___ gal/min

10. SCREENS

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)

11. UPPER END OF WELL:
X Pump Installed Valve Cap Other

12. PUMPING TEST:
Date ___ Test Pump Permanent Pump
Measure point is ___
which is ___ feet above below land surface
Static water level ___ feet above below measure point
Maximum Drawdown ___ feet below measure point
Discharge at maximum drawdown ___ gal/min
After ___ hours

13. PUMP INSTALLED:
Type ___ Make ___ Model No. ___
Motor Power ___ Make ___ H.P. ___
Capacity ___ Gal/min at ___ ft. of total dynamic head
No. of bowls or stages ___
Pump setting ___ feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	42'	48'	Yellow Clay and Rock
	48'	50'	Gray Clay and Rock
	50'	54'	Gray Rock w/ black speck
	54'	62'	Gray Clay w/ black speck
	62'	64'	White Rock w/ black & Brown sp
	64'	91'	White Clay w/ black speck
4	91'	95'	White Rock w/ brown & black speck
	95'	101'	White Clay w/ black speck
	101'	102'	White Rock w/ brown & Black speck
	102'	125'	Gray Clay w/ black speck
	125'	138'	White Rock w/ brown & black speck
	138'	145'	Brown Lime Rock
	145'	151'	White Lime Rock
	151'	160'	Brown Lime Rock

160' BOTTOM OF HOLE

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on 9-20-74 and was completed on 9-20-74

DOUGLAS WD 1066
Contractor License Number
Carl Douglas 604 S 8th
Signature of Representative P.O. Box or Street
WAUCHULA HARDEE FLA
City County State
773-4615 Carl Douglas
Phone Number Driller

FORM: DNR/WW-6

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date 6-20-74

TYPE OR USE BALL POINT PEN AND PRESS HARD!

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

DOUGLAS WD. 1065 604S 8th WAUCHULA FLA 33873
DRILLING CONTRACTOR NUMBER ADDRESS

requests authorization to construct a well for RONALD GILLIARD
NAME OF WELL OWNER

ZOLFO BLD CONT
ADDRESS (MAILING) STREET OR BOX NO. CITY ZIP CODE

Well will be 4 inches in diameter. Proposed yield to be 20 GPM.

Well will be constructed with [X] cable tool [ ] rotary [ ] jetted [ ] other (specify) ______

Well will be approximately 160 feet deep. Well will have about 50 feet of casing

[X] black pipe [ ] galvanized [ ] other ______

Casing will be joined by [X] coupling [ ] weld [ ] both. Space between casing and hole will be sealed with:

[X] natural materials [ ] neat cement grout [ ] other ______

Well will be located at 36 33 25 HARDEE
SECTION, TOWNSHIP, RANGE AND STREET ADDRESS CITY COUNTY

Well will be used for: [X] private supply [ ] public water supply [ ] irrigation [ ] industrial

[ ] test well [ ] other ______

If this permit is for repair, modification or alteration of a well constructed under a pervious permit give number

______ and indicate work to be done ______

______

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor Carl Douglas

I hereby consent to be regulated by Southwest Florida Water Management District and by Southwest Florida Water Management District (Regulatory) regarding consumptive use of water and allocation thereof, and if this permit is granted I agree to comply with the conditions set forth on the reverse side of this form. Access to proposed well site for inspection at any reasonable time is hereby granted personnel of SWFWMD and SWFWMD(R).

Signature of Owner or his authorized Agent Ronald Gilliard

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL 30117-50

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and subject to conditions set forth on the reverse side of this form permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ______, as described on the reverse side of this form, shall be required.

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: Richard P. Haight Date 6-27-74

Title ______

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND <u>SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS,</u>

PROMINENTLY DISPLAYED

SWFWMD-R
SF 1710 REV. 1/2/74

BEST AVAILABLE COPY

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
506 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-8478

Permit No. 75-1637-70

Owner's Well Identification

Nº 14968

For Department Use ONLY

1. OWNER: Ronald Gillimer
Name
Zolfo Springs, Fla
Address City State

2. LOCATION OF WELL:
Street Address/Road
HARDEE
City: Lake Dale County: 78
Subdivision Lot No.
36 33S 25E
Section Township Range

3. PURPOSE OF WELL:
☒ Domestic ☐ Industrial ☐ Irrigation ☐ Stock ☐ Public Supply ☐ Other

4. TYPE OF WORK:
☒ New Well ☐ Deepening ☐ Plugging ☐ Reconditioning ☐ Other

5. QUALITY:
☒ Clear ☐ Colored ☐ Sulfur ☐ Salty ☐ Other

CHECK TEST MADE
☒ None ☐ Bacteria ☐ Chemical
Chloride ___ PPM
(Check ☐ if test was for sodium chloride)
Temperature
Test By: ☐ County Health Dept. ☐ State Health Dept. ☐ U.S.G.S. ☒ Other Thomas W Edenfield
Name
Zolfo Springs, Fla
Address
Well Disinfected ☐ Yes ☒ No

6. EQUIPMENT:
☐ Rotary ☐ Jet ☒ Cable Tool ☐ Reverse Rotary ☐ Other

7. GROUT: ☒ None ☐ Cement ☐ Other

Describe and give number of bags (94lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4"	Black steel	0	60

(Check One) ☐ Threaded & Coupled ☐ Welded Only ☒ T & C & Welded ☐ Other

9. WATER LEVEL:
Water level after well completed 32 feet
☐ Above ☒ Below land surface
Well Flowing: ☐ Yes ☒ No Flow ___ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)
		None			

11. UPPER END OF WELL: ☒ Pump Installed ☐ Valve ☐ Cap ☐ Other

12. PUMPING TEST: ☐ Test Pump ☐ Permanent Pump
Date
Measure point is Top of Ground
which is 6 ft feet ☐ above ☒ below land surface
Static water level 32 feet ☐ above ☐ below measure point
Maximum Drawdown ___ feet below measure point
Discharge at maximum drawdown 20 gal/min
After ___ hours

13. PUMP INSTALLED:
Type ___ Make Sears Model No. MP 402-7
Motor Power Electric Sears H.P. 1/2
Capacity 25 Gal/min at 68 ft. of total dynamic head
No. of bowls or stages
Pump setting 40 ft

14. WELL LOG:

Well Diam. (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	9	Sand
	9	40	Sand & Sandy Clay
	40	54	Green Clay.
	54	165	Lime & Limey Clay

T.D - 165'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on Sept 11 and was completed on Sept 14, 1976

Edenfield Well Drilling 10582
Contractor License Number
Thomas W Edenfield 150
Signature of Representative P.O. Box or Street
Zolfo Springs, Hardee Fla
City County State
735-1181 Thomas W Edenfield
Phone Signature

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL.

To: Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date Sept. 6, 1974

(TYPE OR USE BALLPOINT PEN AND PRESS HARD)

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

Edenfield Well Drilling (DRILLING CONTRACTOR) 1052 (NUMBER) Zolfo Springs (ADDRESS)

requests authorization to construct a well for Ronald Gilliard (NAME OF WELL OWNER)

ADDRESS (MAILING) Elm Street (STREET OR BOX NO.) Zolfo Springs (CITY) 33890 (ZIP CODE)

Well will be 4 inches in diameter. Proposed yield to be 50 GPM.

Well will be constructed with ☒ cable tool ☐ rotary ☐ jetted ☐ other (specify) ________

Well will be approximately 200 feet deep. Well will have about 84 feet of casing

☒ black pipe ☐ galvanized ☐ other ________

Casing will be joined by ☐ coupling ☐ weld ☒ both. Space between casing and hole will be sealed with:

☐ natural materials ☐ neat cement grout ☐ other ________

Well will be located at 36 (SECTION) 33S (TOWNSHIP) 25E (RANGE AND) ____ (STREET ADDRESS) ____ (CITY) Hardee (COUNTY)

Well will be used for ☒ private supply ☐ public water supply ☐ irrigation ☐ industrial

☐ test well ☐ other - For 1 House

If this permit is for repair, modification or alteration of a well constructed under a previous permit give number ________ and indicate work to be done ________

If for modification of a pumping facility which will change quantity pumped indicate old pump ______ HP ______ GPM. new pump ______ HP ______ GPM.

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor [signature]

Access to proposed well site for inspection at any reasonable time is hereby granted personnel of Southwest Florida Water Management District (Regulatory).

Signature of Owner or his Agent Ronald Gilliard

DO NOT WRITE BELOW THIS LINE — FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL 75-1634-30

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ______ , as described on the reverse side of this form, shall be required

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: [signature] Date 9-9-74

Title ________

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS.

PROMINENTLY DISPLAYED

SWFWMD (R)
SF 1778

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION OF CONSTRUCTION OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
505 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-6476

Permit No. 75-1638-20
Owner's Well Identification
№ 14969

For Department Use ONLY

1. OWNER: Ronald Gilliard
E 1st st. Zolfo Springs, Fla
Address City State

2. LOCATION OF WELL:
Street Address/Road
Hardee
County
Lakedale
City
20
Lot No.
Subdivision
36 33S 25E
Section Township Range

3. PURPOSE OF WELL:
[x] Domestic [ ] Industrial [ ] Irrigation [ ] Stock [ ] Public Supply [ ] Other

4. TYPE OF WORK:
[x] New Well [ ] Deepening [ ] Plugging [ ] Reconditioning [ ] Other

5. QUALITY:
[x] Clear [ ] Colored [ ] Sulfur [ ] Salty [ ] Other

CHECK TEST MADE
[x] None [ ] Bacteria [ ] Chemical
Chloride ___ PPM
(Check [ ] if test was for sodium chloride)
Temperature ___ °F
Test By: [ ] County Health Dept. [ ] State Health Dept. [ ] U.S.G.S. [x] Other Thomas W. Edenfield
Zolfo Springs, Fla
Address
Well Disinfected [ ] Yes [x] No

6. EQUIPMENT:
[ ] Rotary [ ] Jet [x] Cable Tool [ ] Reverse Rotary [ ] Other

7. GROUT: [x] None [ ] Cement [ ] Other

Describe and give number of bags (94 lb.)	From (ft)	To (ft)
None		

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4"	Black Steel	0	52

(Check One) [ ] Threaded & Coupled [ ] Welded Only [x] T & C & Welded [ ] Other

9. WATER LEVEL:
Water level after well completed 32 feet
[ ] Above [x] Below land surface
Well Flowing: [ ] Yes [x] No Flow ___ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)
		None			

11. UPPER END OF WELL:
[x] Pump Installed [ ] Valve [ ] Cap [ ] Other

12. PUMPING TEST: [ ] Test Pump [ ] Permanent Pump
Date
Measure point is top of Pipe
which is 1/2 feet [x] above [ ] below land surface
Static water level 32 feet [ ] above [ ] below measure point
Maximum Drawdown ___ feet below measure point
Discharge at maximum drawdown 52 gal/min
After ___ hours

13. PUMP INSTALLED:
Type Shallow well Sears Model No. AP-3C29
Motor Power Black Sears H.P. 1/2
Capacity 22 Gal/min at 52 ft. of total dynamic head
No. of bowls or stages
Pump setting 63 feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 feet intervals and at changes.
4	0	10	Sand
	10	36	Sandy Green clay & Sand
	36	52	Limey Green clay & lime
	52	170	Hard hard limey clay

T.D.-170'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on Sept 8 and was completed on Sept 16, 1974

Edenfield Well Drilling 1052
Contractor License Number
Thomas W Edenfield 150
Signature of Representative P.O. Box or Street
Zolfo Springs, Hardee Fla
City County State
735-1181 Thomas W Edenfield
Phone Number

BEST AVAILABLE COPY

[redacted] (REGULATORY)

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

To: Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date Sept 6, 1974

(TYPE OR USE BALLPOINT PEN AND PRESS HARD)

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

Edenfield Well Drilling 1052 Zolfo Springs
DRILLING CONTRACTOR NUMBER ADDRESS

requests authorization to construct a well for Ronald Gilliard
NAME OF WELL OWNER

Elm Street Zolfo Springs 33850
ADDRESS (MAILING) STREET OR BOX NO. CITY ZIP CODE

Well will be 4 inches in diameter. Proposed yield to be 50 GPM.

Well will be constructed with ☒ cable tool ☐ rotary ☐ jetted ☐ other (specify) ________

Well will be approximately 200 feet deep. Well will have about 84 feet of casing

☒ black pipe ☐ galvanized ☐ other ________

Casing will be joined by ☐ coupling ☐ weld ☒ both. Space between casing and hole will be sealed with:

☒ natural materials ☐ neat cement grout ☐ other ________

Well will be located at 36 33S 25E HARDEE
SECTION, TOWNSHIP, RANGE AND STREET ADDRESS CITY COUNTY

Well will be used for ☒ private supply ☐ public water supply ☐ irrigation ☐ industrial

☐ test well ☐ other For 1 House

If this permit is for repair, modification or alteration of a well constructed under a previous permit give number ________ and indicate work to be done ________

If for modification of a pumping facility which will change quantity pumped indicate old pump ________ HP ________ GPM. new pump ________ HP ________ GPM.

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor [signature]

Access to proposed well site for inspection at any reasonable time is hereby granted personnel of Southwest Florida Water Management District (Regulatory).

Signature of Owner or his Agent Ronald Gilliard

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL 75-1638-20

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ________ , as described on the reverse side of this form, shall be required

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by [signature] Date 9-9-74

Title ________

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS.

PROMINENTLY DISPLAYED

RECEIVED

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION
OF CONSTRUCTION OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
505 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-8476

Permit No. 75-1639-20

Owner's Well Identification

No 14970

1. OWNER: Ronald Gilliam
Name
Elm St. Zolfo Springs, Fla
Address City State

2. LOCATION OF WELL:
Street Address/Road
Hardee
County
Lake Dale
City
Subdivision
Lot No.
36 33S 25E
Section Township Range

3. PURPOSE OF WELL:
☒ Domestic ☐ Irrigation ☐ Public Supply
☐ Industrial ☐ Stock ☐ Other

4. TYPE OF WORK:
☒ New Well ☐ Plugging ☐ Other
☐ Deepening ☐ Reconditioning

5. QUALITY:
☒ Clear ☐ Colored ☐ Sulfur ☐ Salty ☐ Other

CHECK TEST MADE
☒ None
☐ Bacteria
☐ Chemical
Chloride ____ PPM
(Check ☐ if test was for sodium chloride)
Temperature ____ °F
Test By:
☐ County Health Dept.
☐ State Health Dept.
☐ U.S.G.S.
☐ Other Name Edenfield
Zolfo Springs, Fla
Address

Well Disinfected ☐ Yes ☒ No

6. EQUIPMENT:
☐ Rotary ☒ Cable Tool ☐ Other
☐ Jet ☐ Reverse Rotary

7. GROUT: ☒ None ☐ Cement ☐ Other

Describe and give number of bags (94lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4"	Black steel	0	47'-10"

(Check One) ☐ Threaded & Coupled ☐ Welded Only
☒ T & C & Welded ☐ Other

9. WATER LEVEL:
Water level after well completed 31 feet
☐ Above ☒ Below land surface
Well Flowing: ☐ Yes ☒ No Flow ____ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)
		None —			

11. UPPER END OF WELL:
☒ Pump Installed ☐ Valve ☐ Cap ☐ Other

12. PUMPING TEST: ☐ Test Pump ☐ Permanent Pump
Date ____
Measure point is Top of Pipe
which is 1/2 feet ☒ above ☐ below land surface
Static water level 31 feet ☐ above ☐ below measure point
Maximum Drawdown ____ feet below measure point
Discharge at maximum drawdown 25 gal/min
After ____ hours

13. PUMP INSTALLED:
Type Submersible Sears Model No. MP-402-7
Motor Power Elect Make Sears H.P. 1/2
Capacity 25 Gal/min at 60 ft. of total dynamic head
No. of bowls or stages ____
Pump setting 63 feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 50 foot intervals and at changes.
4	0	8'	Sand
	8'	16	Marl
	16	47'	Sandy Green Clay
	47	140	Lime & Limy Green Clay
	140	155	Lime & Limy Clay

T.D. - 155'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on Sept 20 and was completed on Sept 26, 1974

Edenfield Well Drilling 1052
Contractor License Number
[signature]
Signature of Representative
150
P.O. Box or Street
Zolfo Springs, Hardee Fla
City County State
735-1301 [signature]
Phone Number Signature

APPLIC[illegible]N FOR A PERMIT TO CONST[illegible]CT A WELL

To: Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date Sept 6, 1974

(TYPE OR USE BALLPOINT PEN AND PRESS HARD)

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

Edenfield Well Drilling (DRILLING CONTRACTOR) 1052 (NUMBER) Zolfo Springs Fla. (ADDRESS)

requests authorization to construct a well for Ronald Gilliard (NAME OF WELL OWNER)

(ADDRESS) (MAILING) Elm Street (STREET OR BOX NO.) Zolfo Springs, Fla. 33890 (ZIP CODE)

Well will be 4 inches in diameter. Proposed yield to be 50 GPM.

Well will be constructed with ☒ cable tool ☐ rotary ☐ jetted ☐ other (specify) ______

Well will be approximately 200 feet deep. Well will have about 84 feet of casing

☒ black pipe ☐ galvanized ☐ other ______

Casing will be joined by ☐ coupling ☐ weld ☒ both. Space between casing and hole will be sealed with:

☒ natural materials ☐ neat cement grout ☐ other ______

Well will be located at 36 (SECTION) 33S (TOWNSHIP) 25E (RANGE AND) ______ (STREET ADDRESS) ______ (CITY) Hardee (COUNTY)

Well will be used for ☒ private supply ☐ public water supply ☐ irrigation ☐ industrial

☐ test well ☐ other For 1 well (House)

If this permit is for repair, modification or alteration of a well constructed under a previous permit give number

______ and indicate work to be done ______

If for modification of a pumping facility which will change quantity pumped indicate old pump ______ HP

______ GPM. new pump ______ HP ______ GPM.

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor [signature]

Access to proposed well site for inspection at any reasonable time is hereby granted personnel of Southwest Florida Water Management District (Regulatory).

Signature of Owner or his Agent Ronald Gilliard

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL 75/632-20

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ______, as described on the reverse side of this form, shall be required

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by [signature] Date 9-9-74

Title ______

THIS PERMIT [illegible] VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS.

PROMINENTLY DISPLAYED

BEST AVAILABLE COPY

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION OF CONSTRUCTION OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
505 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-8476

Permit No. 75-2114 20
Owner's Well Identification
№ 14972

For Department Use ONLY

OWNER: Ronald Gilliard
Name
E. ... 5th Zolfo Springs, Fla.
Address City State

LOCATION OF WELL:
Street Address/Road
Hardee
City County
Lake Dale 83
Subdivision Lot No.
36 33S 25E
Section Township Range

PURPOSE OF WELL:
☒ Domestic ☐ Industrial ☐ Irrigation ☐ Stock ☐ Public Supply ☐ Other

TYPE OF WORK:
☒ New Well ☐ Deepening ☐ Plugging ☐ Reconditioning ☐ Other

QUALITY:
☒ Clear ☐ Colored ☐ Sulfur ☐ Salty ☐ Other

CHECK TEST MADE
☒ None ☐ Bacteria ☐ Chemical
Chloride ___ PPM
(Check ☐ if test was for sodium chloride)
Temperature ___ °F
Test By: ☐ County Health Dept. ☐ State Health Dept. ☐ U.S.G.S. ☒ Other Thomas Edenfield
Name
Zolfo Springs, Fla.
Address
Well Disinfected ☐ Yes ☒ No

EQUIPMENT:
☐ Rotary ☐ Jet ☒ Cable Tool ☐ Reverse Rotary ☐ Other

GROUT: ☒ None ☐ Cement ☐ Other

Describe and give number of bags (9-Gal.)	From (ft)	To (ft)

CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4"	Black Steel	0	54'

(Check One) ☐ Threaded & Coupled ☐ Welded Only ☒ T & C & Welded ☐ Other

WATER LEVEL:
Water level after well completed 30 feet
☐ Above ☒ below land surface
Well Flowing: ☐ Yes ☒ No Flow ___ gal/min

SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)
		None			

UPPER END OF WELL:
☒ Pump Installed ☐ Valve ☐ Cap ☐ Other

PUMPING TEST: ☐ Test Pump ☒ Permanent Pump
Date
Measure point is Top of Pipe
which is 1/2 feet ☒ above ☐ below land surface
Static water level 30 feet ☐ above ☐ below measure point
Maximum Drawdown ___ feet below measure point
Discharge at Maximum drawdown ___ gal/min
After ___ Hours

PUMP INSTALLED:
Type Shallow Make Sears Model No. MP-402-7
Motor Power Elec. Make Sears H.P. 1/2
Capacity 25 Gal/min at ___ ft. of total dynamic head
No. of bowls or stages
Pump setting 63 feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 50 foot intervals and at changes.
4	0	8	Sand
	8	~~36~~ 26	Marl
	26	38	Sandy Gravel clay
	38	54'	Sandy Gravely stone
	54	170	Hard lime & Limy clay

T.D. - 170'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on Oct. 1
and was completed on Oct. 7, 1974

Edenfield Well Drilling 1052
Contractor License Number
Thomas W. Edenfield 150
Signature of Representative P.O. Box or Street
Zolfo Springs Hardee Fla.
City County State
735-1181 Thomas W. Edenfield
Phone Number Driller

SOUTHWEST FL WATER MANAGEMENT DISTRICT (REGULATORY)

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

To: Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date Sept. 27 1974

TYPE OR USE BALLPOINT PEN AND PRESS HARD!

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

Edenfield Well Drilling — DRILLING CONTRACTOR #1052 NUMBER Zolfo Springs, Fla 33890 ADDRESS

requests authorization to construct a well for Ronald Gilliard NAME OF WELL OWNER

ADDRESS (MAILING) Elm St. STREET OR BOX NO. Zolfo Springs, Fla. CITY 33890 ZIP CODE

Well will be 4 inches in diameter. Proposed yield to be 40 GPM.

Well will be constructed with ☒ cable tool ☐ rotary ☐ jetted ☐ other (specify)

Well will be approximately 180 feet deep. Well will have about 58 feet of casing

☒ black pipe ☐ galvanized ☐ other

Casing will be joined by ☐ coupling ☐ weld ☒ both. Space between casing and hole will be sealed with:

☒ natural materials ☐ neat cement grout ☐ other

Well will be located at 36 SECTION 33S TOWNSHIP 25E RANGE AND STREET ADDRESS CITY Hardee COUNTY

Well will be used for ☒ private supply ☐ public water supply ☐ irrigation ☐ industrial

☐ test well ☐ other Well for 1 House. #83-#84 #85 #86-#87 Houses Are On 1 Acre Lots-

If this permit is for repair, modification or alteration of a well constructed under a previous permit give number ______ and indicate work to be done ______

If for modification of a pumping facility which will change quantity pumped indicate old pump ______ HP ______ GPM. new pump ______ HP ______ GPM.

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor [signature]

Access to proposed well site for inspection at any reasonable time is hereby granted personnel of Southwest Florida Water Management District (Regulatory).

Signature of Owner or his Agent Ronald Gilliard

DO NOT WRITE BELOW THIS LINE — FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL 75-2114

20

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ______, as described on the reverse side of this form, shall be required

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: [signature] Date 9-30-74

Title ______

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS.

PROMINENTLY DISPLAYED

SWFWMD (R)
SF 1710

#352

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
905 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-6476

Permit No. 75-[illegible]58-70

Owner's Well Identification

Nº 14980

State Well Number — For Department Use ONLY

1. OWNER: Ronald Gillias
Name
Elast Zolfo Springs, Fla. 33890
Address City State

2. LOCATION OF WELL:
Street Address/Road
HARDEE
City County
Lake Dale 93
Subdivision Lot No.
36 33S 25E
Section Township Range

3. PURPOSE OF WELL:
☒ Domestic ☐ Irrigation ☐ Public Supply
☐ Industrial ☐ Stock ☐ Other

4. TYPE OF WORK:
☒ New Well ☐ Plugging ☐ Other
☐ Deepening ☐ Reconditioning

5. QUALITY:
☒ Clear ☐ Colored ☐ Sulfur ☐ Salty ☐ Other

CHECK TEST MADE
☒ None
☐ Bacteria
☐ Chemical
Chloride ____ PPM
(Check ☐ if test was for sodium chloride)
Temperature ____ °F
Test By:
☐ County Health Dept.
☐ State Health Dept.
☐ U.S.G.S.
☒ Other Thomas E Edenfield
Name
Zolfo Springs, Fla
Address
Well Disinfected ☐ Yes ☐ No

6. EQUIPMENT:
☐ Rotary ☒ Cable Tool ☐ Other
☐ Jet ☐ Reverse Rotary

7. GROUT: ☒ None ☐ Cement ☐ Other

Describe and give number of bags (9-Gln.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (Inches)	Kind	From (ft)	To (ft)
4"	Black Steel	0	57

(Check One) ☐ Threaded & Coupled ☐ Welded Only
☒ T & C & Welded ☐ Other

9. WATER LEVEL:
Water level after well completed 33 feet
☐ Above ☒ Below land surface
Well Flowing: ☐ Yes ☒ No Flow ____ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)
None					

11. UPPER END OF WELL:
☒ Pump Installed ☐ Valve ☐ Cap ☐ Other

12. PUMPING TEST:
Date Feb 5, 1975 ☐ Test Pump ☒ Permanent Pump
Measure point is Top of Pipe
which is 1 feet ☒ above ☐ below land surface
Static water level 33 feet ☐ above ☒ below measure point
Maximum Drawdown ____ feet below measure point
Discharge at maximum drawdown ____ gal/min
After ____ hours

13. PUMP INSTALLED:
Type Submersible Make Sears Model No. 2866
Motor Power Electric Make Sears H.P. 1/2
Capacity 74 Gal/min at 30 ft. of total dynamic head
No. of bowls or stages ____
Pump setting 84 feet

14. WELL LOG:

Well Diameter (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	9	Sand-
	9	28	Marl-
	28	56'	Sandy Green Clay & Sand-
	56	125	Hard Lime & Gray Clay
			T.D-125'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on Feb 3, 1975 and was completed on Feb 5, 1975

Edenfield Well Drilling 1052
Contractor License Number
Thomas W Edenfield 150
Signature of Representative P.O. Box or Street
Zolfo Springs Hardee Fla. 33890
City County State
735-1181 Phillip Edenfield
Phone Number Driller

FORM: DNR/DIR-5

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION
OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
[illegible] Larson Building, Tallahassee, Florida 32304
Telephone: (904) [illegible]

4256
Permit No. 25-[illegible]-20

Owner's Well Identification

Nº 14974

For Department Use ONLY

State Well Number

1. OWNER: Ronald Gilliam
Name
Elysh Zolfo Springs Fla-
Address City State

2. LOCATION OF WELL:
Street Address/Road
Hardee
County
LakeDale- 83
City
Subdivision Lot No.
36 33S 25E
Section Township Range

3. PURPOSE OF WELL:
☒ Domestic ☐ Irrigation ☐ Public Supply
☐ Industrial ☐ Stock ☐ Other

4. TYPE OF WORK:
☒ New Well ☐ Plugging ☐ Other
☐ Deepening ☐ Reconditioning

5. QUALITY:
☒ Clear ☐ Colored ☐ Sulfur ☐ Salty ☐ Other

CHECK TEST MADE
☒ None
☐ Bacteria
☐ Chemical
Chloride ____ PPM
(Check ☐ if test was for sodium chloride)
Temperature ____ °F
Test By:
☐ County Health Dept.
☐ State Health Dept.
☐ U.S.G.S.
☒ Other Thomas Edenfield
Name
Zolfo Springs Fla.
Address

Well Disinfected ☐ Yes ☒ No

6. EQUIPMENT:
☐ Rotary ☒ Cable Tool ☐ Other
☐ Jet ☒ Reverse Rotary

7. GROUT: ☒ None ☐ Cement ☐ Other

Describe and give number of bags (94 lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4	BlackSteel	0	52

(Check One) ☐ Threaded & Coupled ☐ Welded Only
☒ T & C & Welded ☐ Other

9. WATER LEVEL:
Water level after well completed 31 feet
☐ Above ☒ Below land surface
Well Flowing: ☐ Yes ☒ No Flow ____ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)
	None	—			

11. UPPER END OF WELL:
☒ Pump Installed ☐ Valve ☐ Cap ☐ Other

12. PUMPING TEST:
Date Dec-10, 1974 ☐ Test Pump ☒ Permanent Pump
Measure point is Top of pipe-
which is 1 feet ☒ above ☐ below land surface
Static water level 31 feet ☐ above ☒ below measure point
Maximum Drawdown ____ feet below measure point
Discharge at maximum drawdown 20 gal/min
After ____ hours

13. PUMP INSTALLED:
Type Shallow Make Sears Model No. 2866
Motor Power Electric Sears H.P. 1/2
Capacity 20 Gal/min at 34 ft. of total dynamic head
No. of bowls or stages
Pump setting 24 feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	8	sand
	8	22	marl
	22	51	sand-sandy Green clay
	51	53	Hardlime-
	53	170	Lime Limeyclay-

T.D. 170'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on Dec-6 1974 and was completed on Dec-10 1974

Edenfield Well Drilling 1052
Contractor License Number
Thomas W. Edenfield 150
Signature of Representative P.O. Box or Street
Zolfo Springs Hardee Fla
City County State
735-1181 Thomas W. Edenfield
Phone Number Driller

FORM: DNR/BW-6

BEST AVAILABLE COPY

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

~~UNDER A SPECIAL CERTIFICATE OF REGISTRATION~~

TO: CHIEF HYDROLOGIST
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)
Post Office Box 457
Brooksville, Florida 33512

DATE 1/20/75

(PLEASE TYPE OR PRINT IN BALLPOINT PEN)

In compliance with the Rules and Regulations Sections 1.01 through 1.08, inclusive, Southwest Florida Water Management District (Regulatory) adopted pursuant to Section 373.171, Florida Statutes, the undersigned

Patterson Well Drilling 2406 (Reg. No.) of 2805 S. Goldenrod Rd. Orlando, Fla. 32807 (Address)
(Firm or Driller)

applies for a permit and approval of the Southwest Florida Water Management District (Regulatory) for the construction of a well(s) under a special certificate of registration in

Section 24 Township 20 Range 18 Citrus (County)

(City)

491 (Street or Rural Route)

1. The purpose of the well(s) is Irrigation for Pasture

2. 6" well(s) will be Cable Tool (Type jetted, cable tool rotary or other designate) 6" inches in diameter; to the approximate depth of 150 feet and will be Black Iron material and will have Drive Shoe there will be 90' feet of casing, constructed of Black Iron Proposed yield 175 GPM
on Top of Drive Shoe on bottom (proposed type of casing seal)

3. Will the space between the casing and the hole be sealed? ☑ Yes ☐ No

If so, at what points? Top To Bottom

4. Will any abandoned hole be sealed? ☑ Yes ☐ No How? Cemented

The required accompanying paper is enclosed herewith; plat or sketch showing location of proposed well(s) relative to existing buildings or other physical features, especially the locations of all known sources of contamination in the vicinity.

75 4352 - 12

I agree that:

A log, (SWFWMD(R) SF-1840-2), showing the various strata or formations pierced by the well will be forwarded within thirty (30) days after completion or cessation of drilling operation. Compliance with all provisions of the Rules and Regulations of the Southwest Florida Water Management District (Regulatory) cited above will be accomplished.

Access to proposed well sites for inspection at any reasonable time is hereby granted personnel of Southwest Florida Water Management District (Regulatory).

No Bldgs. within

(Signature of Well Drilling Contractor)

(Signature of Owner)

Randall F. Patterson
(Printed Name & Title)

Edwin O'Neill
(Printed Name of Well Owner)

2805 S. Goldenrod Rd.
Orlando, Fla. 32807
(Address)

1/21/75
(Date)

(Address)

(Title)

Approved by
Authorized representative of SWFWMD(R)

RETURN TO CHIEF HYDROLOGIST

SWFWMD

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION
OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
565 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-6476

Permit No. 75-~~5844~~ 4257 -20

Owner's Well Identification

Nº 14976

State Well Number
For Department Use ONLY

1. OWNER: Ronald Gilliam
Name
E Last Zolfo Springs Fla-
Address City State

2. LOCATION OF WELL:
Street Address/Road
Hardee-
City County
Lake Dale- 25
Subdivision Lot No.
36 33S 25E-
Section Township Range

3. PURPOSE OF WELL:
☒ Domestic ☐ Irrigation ☐ Public Supply
☐ Industrial ☐ Stock ☐ Other

4. TYPE OF WORK:
☒ New Well ☐ Plugging ☐ Other
☐ Deepening ☐ Reconditioning

5. QUALITY:
☒ Clear ☐ Colored ☐ Sulfur ☐ Salty ☐ Other
CHECK TEST MADE
☒ None
☐ Bacteria
☐ Chloride
Chloride ____ PPM
(Check ☐ if test was for sodium chloride)
Temperature ____ °F
Test By:
☐ County Health Dept.
☐ State Health Dept.
☐ U.S.G.S.
☒ Other Thomas Edenfield
Name
Zolfo Springs Fla
Address
Well Disinfected ☐ Yes ☒ No

6. EQUIPMENT:
☐ Rotary ☒ Cable Tool ☐ Other
☐ Jet ☐ Reverse Rotary

7. GROUT: ☒ None ☐ Cement ☐ Other

Describe and give number of bags (5Gal.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4	Black steel	0	53

(Check One) ☐ Threaded & Coupled ☐ Welded Only
☒ T & C & Welded ☐ Other

9. WATER LEVEL:
Water level after well completed 34 feet
☐ Above ☒ Below land surface
Well Flowing: ☐ Yes ☒ No Flow ____ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)
	None				

11. UPPER END OF WELL:
☒ Pump Installed ☐ Valve ☐ Cap ☐ Other

12. PUMPING TEST:
Date Dec- 18 1974 ☐ Test Pump ☒ Permanent Pump
Measure point is Top of pipe
which is 1 feet ☒ above ☐ below land surface
Static water level 34 feet ☐ above ☒ below measure point
Maximum Drawdown ____ feet below measure point
Discharge at maximum drawdown ____ gal/min
After ____ hours

13. PUMP INSTALLED:
Type Submer Make Sears Model No. 2866
Motor Power Electric Sears H.P. 1/2
Capacity 20 Gal/min at 32 ft. of total dynamic head
No. of bowls or stages ____
Pump setting 84' feet

14. WELL LOG:

Well Diam. (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	6	Sand-
	6	20	Marl
	20'	52	Sandy Gravel clay & Sand
	52	55	Hard lime -
	55	185'	Lime & Limey clay-

TD 185'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on Dec-14 and was completed on Dec 18, 1974

Edenfield Well Drilling 1052
Contractor License Number
Thomas Edenfield 150
Signature of Representative P.O. Box or Street
Zolfo Springs Hardee Fla 33890
City County State
735-1181 Phillip Edenfield
Phone Number Driller

FORM: DNR/BW-6

4258

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
565 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-6476

Permit No. 25-[illegible]-20

Owner's Well Identification

№ 14975

For Department Use ONLY — State Well Number

1. OWNER: Ronald Gilliard
Name / Address / City / State: Eland Zolfo Springs Fla.

2. LOCATION OF WELL:
Street Address/Road: Hardee
City: Lake Dale   County: 84
Subdivision / Lot No.
Section: 36 Township: 33S Range: 25E

3. PURPOSE OF WELL: ☒ Domestic ☐ Industrial ☐ Irrigation ☐ Stock ☐ Public Supply ☐ Other

4. TYPE OF WORK: ☒ New Well ☐ Deepening ☐ Plugging ☐ Reconditioning ☐ Other

5. QUALITY: ☒ Clear ☐ Colored ☐ Sulfur ☐ Salty ☐ Other
CHECK TEST MADE
☒ None ☐ Bacteria ☐ Chemical
Chloride ____ PPM
(Check ☐ if test was for sodium chloride)
Temperature ____ °F
Test By: ☐ County Health Dept. ☐ State Health Dept. ☐ U.S.G.S. ☒ Other: Thomas Edenfield
Address: Zolfo Springs Fla.
Well Disinfected ☐ Yes ☒ No

6. EQUIPMENT: ☐ Rotary ☐ Jet ☒ Cable Tool ☐ Reverse Rotary ☐ Other

7. GROUT: ☒ None ☐ Cement ☐ Other

Describe and give number of bags (94 lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4	Black Steel	0	53'

(Check One) ☐ Threaded & Coupled ☐ Welded Only ☒ T & C & Welded ☐ Other

9. WATER LEVEL:
Water level after well completed 33 feet ☐ Above ☒ Below land surface
Well Flowing: ☐ Yes ☒ No Flow ____ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)
None					

11. UPPER END OF WELL: ☒ Pump Installed ☐ Valve ☐ Cap ☐ Other

12. PUMPING TEST:
Date Dec. 13, 1974 ☐ Test Pump ☒ Permanent Pump
Measure point is top of pipe
which is 1/2 feet ☒ above ☐ below land surface
Static water level 33 feet ☐ above ☒ below measure point
Maximum Drawdown ____ feet below measure point
Discharge at maximum drawdown ____ gal/min
After ____ hours

13. PUMP INSTALLED:
Type Submersible Make Sears Model No. 2866
Motor Power Elect. Make Sears H.P. 1/2
Capacity 20 Gal/min at 30 ft. of total dynamic head
No. of bowls or stages ____
Pump setting 84 feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	7	Sand -
	7 -	20	Marl
	20'	55'	Sand & Sandy Gravel clay -
	55'	57'	Hard lime '
	57'	175	Lime & limey clay —

T.D. 175'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on Dec-10 and was completed on Dec. 13, 1974

Contractor: Edenfield Well Drilling License Number: 1052
Signature of Representative: Thomas Edenfield P.O. Box or Street: 150
City: Zolfo Springs County: Hardee State: Fla. 33890
Phone Number: 735118 Driller: Phillip Edenfield

FORM: DNR/WW-2

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION
OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
[illegible] Larson Building, Tallahassee, Florida 32304
Telephone: (904) [illegible]

Form 4357 75- ~~[illegible]~~ 20

Owner's Well Identification

For Department Use ONLY

Nº 14978

1. OWNER: Ranald Gilliam
Name
E 1st Zolfo Springs Fla.
Address City State

2. LOCATION OF WELL:
Street Address/Road
HARDEE
County
City Lake Dale 87
Subdivision Lot No.
36 33S 25E
Section Township Range

3. PURPOSE OF WELL:
☒ Domestic ☐ Irrigation ☐ Public Supply
☐ Industrial ☐ Stock ☐ Other

4. TYPE OF WORK:
☒ New Well ☐ Plugging ☐ Other
☐ Deepening ☐ Reconditioning

5. QUALITY:
☒ Clear ☐ Colored ☐ Sulfur ☐ Salty ☐ Other

CHECK TEST MADE
☒ None
☐ Bacteria
☐ Chemical
Chloride ____ PPM
(Check ☐ if test was for sodium chloride)
Temperature ____°
Test By:
☐ County Health Dept.
☐ State Health Dept.
☐ U.S.G.S.
☒ Other Thomas Edenfield
Name
Zolfo Springs, Fla.
Address
Well Disinfected ☐ Yes ☒ No

6. EQUIPMENT:
☐ Rotary ☒ Cable Tool ☐ Other
☐ Jet ☐ Reverse Rotary

7. GROUT: ☒ None ☐ Cement ☐ Other

Describe and give number of bags (94lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4	Black Steel	0	60'

☐ Black Cast ☐ Threaded & Coupled ☐ Welded Only
☒ T & C & Welded ☐ Other

9. WATER LEVEL:
Water level after well completed 35 feet
☐ Above ☒ Below land surface
Well Flowing: ☐ Yes ☒ No Flow ____ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)
		None			

11. UPPER END OF WELL:
☒ Pump Installed ☐ Valve ☐ Cap ☐ Other

12. PUMPING TEST:
Date Jan 3, 1975 ☐ Test Pump ☒ Permanent Pump
Measure point is Top of Pipe
which is 1 feet ☒ above ☐ below land surface
Static water level 35 feet ☐ above ☒ below measure point
Maximum Drawdown ____ feet below measure point
Discharge at maximum drawdown ____ gal/min
After ____ hours

13. PUMP INSTALLED:
Type Submerge Make Sears Model No. 2866
Motor Power Elec. Make Sears H.P. 1/2
Capacity 20 Gal/min at 30 ft. of total dynamic head
No. of bowls or stages
Pump setting 84 feet

14. WELL LOG:

Well Diam. (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	9	Sand-
	9	26	Marl
	26	59	Sandy Clay & Sand-
	59	63	Hard Lime
	63	185	Lime & Limy Clay-
			T.D. 185'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on Dec 27-1974 and was completed on Jan. 3, 1975

Edenfield Well Drilling 1052
Contractor License Number
Thomas W Edenfield 150
Signature of Representative P.O. Box or Street
Zolfo Springs HARDEE Fla. 33890
City County State
735-1181 Phillip Edenfield
Phone Number Driller

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
505 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-6476

Permit No. 25-~~[illegible]~~ 4260 70

Owner's Well Identification

No 14977

For Department Use ONLY — State Well Number

1. OWNER: Ronald Gilliam
Elwest Zolfo Springs Fla
Address City State

2. LOCATION OF WELL:
Street Address or Road
HARDEE
City Lake Dale County
Subdivision 26 Lot No.
36 23S 25E
Section Township Range

3. PURPOSE OF WELL:
☒ Domestic ☐ Irrigation ☐ Public Supply
☐ Industrial ☐ Stock ☐ Other

4. TYPE OF WORK:
☒ New Well ☐ Plugging ☐ Other
☐ Deepening ☐ Reconditioning

5. QUALITY:
☒ Clear ☐ Colored ☐ Sulfur ☐ Salty ☐ Other

CHECK TEST MADE
☒ None ☐ Bacteria ☐ Chemical
Chloride ____ PPM
(Check ☐ if test was for sodium chloride)
Temperature ____ °F
Test By: ☐ County Health Dept. ☐ State Health Dept. ☐ U.S.G.S. ☒ Other Thomas Edenfield
Name
Zolfo Springs, Fla
Address
Well Disinfected ☐ Yes ☒ No

6. EQUIPMENT:
☐ Rotary ☒ Cable Tool ☐ Other
☐ Jet ☐ Reverse Rotary

7. GROUT: ☒ None ☐ Cement ☐ Other

Describe and give number of bags (94-lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4"	Black Steel	0	56'6"

(Check One) ☐ Threaded & Coupled ☐ Welded Only
☒ T & C & Welded ☐ Other

9. WATER LEVEL:
Water level after well completed 33 feet
☐ Above ☒ below land surface
Well Flowing: ☐ Yes ☒ No Flow ____ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)
	None				

11. UPPER END OF WELL:
☒ Pump Installed ☐ Valve ☐ Cap ☐ Other

12. PUMPING TEST:
Date Dec 23, 1974 ☐ Test Pump ☒ Permanent Pump
Measure point is Top of Pipe
which is 1 feet ☒ above ☐ below land surface
Static water level 33 feet ☐ above ☐ below measure point
Maximum Drawdown ____ feet below measure point
Discharge at maximum drawdown ____ gal/min
After ____ hours

13. PUMP INSTALLED:
Type Sub[illegible] Make Sears Model No. 2866
Motor Power Electric Sears H.P. 1/2
Capacity 20 Gal/min at 30 ft. of total dynamic head
No. of bowls or stages
Pump setting 84 feet

14. WELL LOG:

Well Bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	7	Sand -
	7	27	Marl
	27	54	Sandy Clay & Sand -
	54	57'	Hard lime
	57'	185	Lime & limey Clay

TD - 185'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on Dec 19 and was completed on Dec. 23 1974

Edenfield Well Drilling 10521
Contractor License Number
Thomas W. Edenfield 150
Signature of Representative P.O. Box or Street
Zolfo Springs HARDEE Fla -
City County State
735-1181 Phillip Edenfield
Phone Number Driller

FORM: 2002/WW-0

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION
OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-3475

Permit No. 75-4267-20

Owner's Well Identification

№ 14981

For Department Use ONLY — State Well Number

1. OWNER: Ronald Gillmain
Name
E. Last. Zolfo Springs Fla 33890
Address City State

2. LOCATION OF WELL:
Street Address/Road
Hardee —
City County
Lakedale 97
Subdivision Lot No.
36 33S 25E
Section Township Range

3. PURPOSE OF WELL:
☒ Domestic ☐ Irrigation ☐ Public Supply
☐ Industrial ☐ Stock ☐ Other

4. TYPE OF WORK:
☒ New Well ☐ Plugging ☐ Other
☐ Deepening ☐ Reconditioning

5. QUALITY:
☒ Clear ☐ Colored ☐ Sulfur ☐ Salty ☐ Other

CHECK TEST MADE
☒ None
☐ Bacteria
☐ Chemical
Chloride ___ PPM
(Check ☐ if test was for sodium chloride)
Temperature ___ °F

Test By:
☐ County Health Dept.
☐ State Health Dept.
☐ U.S.G.S.
☒ Other Thomas Edenfield
Name
Zolfo Springs Fla.
Address

Well Disinfected ☐ Yes ☒ No

6. EQUIPMENT:
☐ Rotary ☒ Cable Tool ☐ Other
☐ Jet ☐ Reverse Rotary

7. GROUT: ☒ None ☐ Cement ☐ Other

Describe and give number of bags (3-Gal.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches) Kind	From (ft)	To (ft)
4" Black Steel	0	57'

(Check One) ☐ Threaded & Coupled ☐ Welded Only
☒ T & C & Welded ☐ Other

9. WATER LEVEL:
Water level after well completed 36 feet
☐ Above ☒ Below land surface
Well Flowing: ☐ Yes ☒ No Flow ___ gal/min

10. SCREENS:

Make	Material	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)
None					

11. UPPER END OF WELL:
☒ Pump Installed ☐ Valve ☐ Cap ☐ Other

12. PUMPING TEST:
Date Feb 10 1975 ☐ Test Pump ☒ Permanent Pump
Measure point is Top of pipe
which is 1 feet ☒ above ☐ below land surface
Static water level 36 feet ☐ above ☒ below measure point
Maximum Drawdown ___ feet below measure point
Discharge at maximum drawdown ___ gal/min
After ___ hours

13. PUMP INSTALLED:
Type Jet Make Sears Model No. 2866
Motor Power Electric Sears H.P. ½
Capacity 20 Gal/min at 32 ft. of total dynamic head
No. of bowls or stages
Pump setting 84 feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	7	Sand —
	7'	27	Marl —
	27	56'	Sandy Green Clay & Sand —
	56'	180	Hard Lime & Limey Clay —

T. D - 180'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on Feb 6 1975 and was completed on Feb 10, 1975

Edenfield Well Drilling 1052
Contractor License Number
Thomas Wilder of Edenfield 150
Signature of Representative P.O. Box or Street
Zolfo Springs, Hardee Fla 33890
City County State
735-1181 Phillip Edenfield
Phone Number Driller

FORM: DNR/SW-5

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
505 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-8476

Permit No. 75-4265-20

Owner's Well Identification

№ 14983

For Department Use ONLY — State Well Number

1. OWNER: Ronald Gillians
Name
E Tuly 2olfoSprings Fla.
Address City State

2. LOCATION OF WELL:
Street Address and
HARDEE
City County
LakeDale 160
Subdivision Lot No.
36 33S 25E
Section Township Range

3. PURPOSE OF WELL: ☒ Domestic ☐ Irrigation ☐ Public Supply ☐ Industrial ☐ Stock ☐ Other

4. TYPE OF WORK: ☒ New Well ☐ Plugging ☐ Other ☐ Deepening ☐ Reconditioning

5. QUALITY: ☒ Clear ☐ Colored ☐ Sulfur ☐ Salty ☐ Other

CHECK TEST MADE
☒ None ☐ Bacteria ☐ Chemical
Chloride ___ PPM
(Check ☐ if test was for sodium chloride)
Temperature ___ °F
Test By: ☐ County Health Dept. ☐ State Health Dept. ☐ U.S.G.S. ☒ Other Thomas Edenfield
Name
ZolfoSprings Fla.
Address
Well Disinfected ☐ Yes ☒ No

6. EQUIPMENT: ☐ Rotary ☐ Jet ☒ Cable Tool ☐ Reverse Rotary ☐ Other

7. GROUT: ☐ None ☐ Cement ☐ Other

Describe and give number of bags (94 lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (Inches)	Kind	From (ft)	To (ft)
4"	BlackSteel	0	63

(Check One) ☐ Threaded & Coupled ☐ Welded Only ☒ T & C & Welded ☐ Other

9. WATER LEVEL:
Water level after well completed 35' feet ☐ Above ☐ Below land surface
Well Flowing: ☐ Yes ☒ No Flow ___ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)
		None			

11. UPPER END OF WELL: ☒ Pump Installed ☐ Valve ☐ Cap ☐ Other

12. PUMPING TEST:
Date Feb 21, 1975 ☐ Test Pump ☒ Permanent Pump
Measure point is Top of pipe
which is 1 feet ☒ above ☐ below land surface
Static water level 35 feet ☐ above ☒ below measure point
Maximum Drawdown ___ feet below measure point
Discharge at maximum drawdown ___ gal/min
After ___ hours

13. PUMP INSTALLED:
Type Sub Make Sears Model No. 2866
Motor Power Elec Sears H.P. 1/2
Capacity 20 Gal/min at 30 ft. of total dynamic head
No. of bowls or stages ___
Pump setting 84' feet

14. WELL LOG:

Well Diam. (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	8	Sand-
	8	26	Marl
	26	62	SandyGreenClay & Sand-
	62'	130	Hard Lime & Limeyclay—
	130'	132'	Cavity —

T.D — 132'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on Feb 14, 1975 and was completed on Feb 21, 1975

Edenfield Well Drilling 1052
Contractor License Number
Thomas Edenfield 150
Signature of Representative P.O. Box or Street
ZolfoSprings HARDEE Fla. 33890
City County State
735-1181 Phillip Edenfield
Phone Number Driller

FORM: DNR/DW-6

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION
OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
505 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-6476

Permit No. 5-4338-20

Owner's Well Identification

№ 5447

For Department Use ONLY
State Well Number

1. OWNER: RONALD GILLIARD FLA
Name Address City State

2. LOCATION OF WELL: LAKE DALE RD
Street Address/Road
LAKE DALE HARDEE
City County
Subdivision Lot No.
36 33 25
Section Township Range

3. PURPOSE OF WELL:
[X] Domestic [ ] Irrigation [ ] Public Supply
[ ] Industrial [ ] Stock [ ] Other

4. TYPE OF WORK:
[X] New Well [ ] Plugging [ ] Other
[ ] Deepening [ ] Reconditioning

5. QUALITY:
[X] Clear [ ] Colored [X] Sulfur [ ] Salty [ ] Other

CHECK TEST MADE
[X] None
[ ] Bacteria
[ ] Chemical
Chloride ____ PPM
(Check [ ] if test was for sodium chloride)
Temperature 76 °F
Well Disinfected [X] Yes [ ] No

Test By:
[ ] County Health Dept.
[ ] State Health Dept.
[ ] U.S.G.S.
[ ] Other
Name
Address

6. EQUIPMENT:
[ ] Rotary [X] Cable Tool [ ] Other
[ ] Jet [ ] Reverse Rotary

7. GROUT: [X] None [ ] Cement [ ] Other

Describe and give number of bags (94lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches) Kind	From (ft)	To (ft)
4" Sch 40 BLACK IRON	0	57

(Check One) [X] Threaded & Coupled [ ] Welded Only
[ ] T & C & Welded [ ] Other

9. WATER LEVEL:
Water level after well completed 60 feet
[ ] Above [X] Below land surface
Well Flowing: [ ] Yes [X] No Flow ____ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)

11. UPPER END OF WELL:
[X] Pump installed [ ] Valve [ ] Cap [ ] Other

12. PUMPING TEST: [ ] Test Pump [ ] Permanent Pump
Date
Measure point is ____
which is ____ feet [ ] above [ ] below land surface
Static water level ____ feet [ ] above [ ] below measure point
Maximum Drawdown ____ feet below measure point
Discharge at maximum drawdown ____ gal/min
After ____ hours

13. PUMP INSTALLED:
Type ____ Make ____ Model No. ____
Motor Power ____ Make ____ H.P. ____
Capacity ____ Gal/min at ____ ft. of total dynamic head
No. of bowls or stages ____
Pump setting ____ feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	35	SAND YELLOW
	35	56	CLAY GREEN
	56	58	ROCK GRAY
	58	86	CLAY GRAY
	86	89	ROCK WHITE
	89	130	CLAY GRAY
	130	145	ROCK BROWN
			BOTTOM OF HOLE 145'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on 3-1-74 and was completed on 3-10-74

DOUGLAS W.D. 1065
Contractor License Number
Carl Douglas 604 S 8th
Signature of Representative P.O. Box or Street
WAUCHULA HARDEE FLA.
City County State
7734615 Carl Douglas
Phone Number Driller

FORM: DNR/SW-2

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION
OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
506 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-8476

Permit No. 6-4337-20

Owner's Well Identification

Nº 5431

For Department Use ONLY — State Well Number

1. OWNER: RONALD GILLIARD
Name
FLA
Address City State

2. LOCATION OF WELL: LAKE DALE RD.
Street Address/Road
LAKEDALE HARDEE
City County
Subdivision Lot No.
36 33 25
Section Township Range

3. PURPOSE OF WELL:
☒ Domestic ☐ Irrigation ☐ Public Supply
☐ Industrial ☐ Stock ☐ Other

4. TYPE OF WORK:
☒ New Well ☐ Plugging ☐ Other
☐ Deepening ☐ Reconditioning

5. QUALITY:
☒ Clear ☐ Colored ☒ Sulfur ☐ Salty ☐ Other

CHECK TEST MADE
☒ None
Bacteria
Chemical
Chloride ___ PPM
(Check __ if test was for sodium chloride)
Test By:
☐ County Health Dept.
☐ State Health Dept.
☐ U.S.G.S.
☐ Other
Name
Address
Temperature 70°
Well Disinfected ☒ Yes ☐ No

6. EQUIPMENT:
☐ Rotary ☒ Cable Tool ☐ Other
☐ Jet ☐ Reverse Rotary

7. GROUT: ☒ None ☐ Cement ☐ Other

Describe and give number of bags (94lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
Sch 40	BLACK IRON 4"	0	60

(Check One) ☐ Threaded & Coupled ☐ Welded Only
☐ T & C & Welded ☐ Other

9. WATER LEVEL:
Water level after well completed 58 feet
☐ Above ☒ Below land surface
Well Flowing: ☐ Yes ☐ No Flow ___ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)

11. UPPER END OF WELL:
☒ Pump Installed ☐ Valve ☐ Cap ☐ Other

12. PUMPING TEST:
Date ___ ☐ Test Pump ☐ Permanent Pump
Measure point is ___
which is ___ feet ☐ above ☐ below land surface
Static water level ___ feet ☐ above ☐ below measure point
Maximum Drawdown ___ feet below measure point
Discharge at maximum drawdown ___ gal/min
After ___ hours

13. PUMP INSTALLED:
Type ___ Make ___ Model No. ___
Motor Power ___ Make ___ H.P. ___
Capacity ___ Gal/min at ___ ft. of total dynamic head
No. of bowls or stages ___
Pump setting ___ feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	37	SAND YELLOW.
	37	57	CLAY GREEN
	57	59	ROCK GRAY
	59	85	CLAY GRAY
	85	88	ROCK WHITE
	88	131	CLAY GRAY
	131	160	ROCK BROWN
	160		
			BOTTOM OF HOLE 160'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on 3-10-75 and was completed on 3-15-75

DOUGLAS WD. 1065
Contractor License Number
Carl Douglas 6043 86
Signature of Representative P.O. Box or Street
WAUCHULA HARDEE FLA.
City County State
7734615 Carl Douglas
Phone Number Driller

FORM: DNR/SW-3

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)
APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

To: Chief, Permits Department
Post Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date 1-22-75

TYPE OR USE BALL POINT PEN AND PRESS HARD!

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

DOUGLAS WD (DRILLING CONTRACTOR) 1065 (NUMBER) 604 S 8th WAUCHULA FLA 33873 (ADDRESS)

requests authorization to construct a well for RONALD GILLIARD (NAME OF WELL OWNER)

ZOLFO BLD. CONT (ADDRESS (MAILING) STREET OR BOX NO.) LAKEDALE (CITY) 33873 (ZIP CODE)

Well will be 4 inches in diameter. Proposed yield to be 20 GPM.

Well will be constructed with [X] cable tool [ ] rotary [ ] jetted [ ] other (specify) ______

Well will be approximately 170 feet deep. Well will have about 55 feet of casing

[X] black pipe [ ] galvanized [ ] other ______

Casing will be joined by [X] coupling [ ] weld [ ] both. Space between casing and hole will be sealed with:

[X] natural materials [ ] neat cement grout [ ] other ______

Well will be located at 36 33 25 (SECTION, TOWNSHIP, RANGE AND STREET ADDRESS) LAKE DALE (CITY) HARDEE (COUNTY)

Well will be used for: [X] private supply [ ] public water supply [ ] irrigation [ ] industrial

[ ] test well [ ] other ______

If this permit is for repair, modification or alteration of a well constructed under a pervious permit give number ______ and indicate work to be done ______

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor Carl Douglas

I hereby consent to be regulated by Southwest Florida Water Management District and by Southwest Florida Water Management District (Regulatory) regarding consumptive use of water and allocation thereof, and if this permit is granted I agree to comply with the conditions set forth on the reverse side of this form. Access to proposed well site for inspection at any reasonable time is hereby granted personnel of SWFWMD and SWFWMD(R).

Signature of Owner or his authorized Agent Ronald Gilliard

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL 75-4331-20

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and subject to conditions set forth on the reverse side of this form permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ______, as described on the reverse side of this form, shall be required.

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: [signature] Date 1-24-75

Title ______

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS.

PROMINENTLY DISPLAYED

SWFWMD (R)
SF 1710 REV. 1/2/74

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION
OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
506 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-6476

Permit No. 5-4340-20

Owner's Well Identification

Nº 5468

State Well Number — For Department Use ONLY

1. OWNER: RONALD GILLIARD
Name
Address City State FLA

2. LOCATION OF WELL: LAKEDALE RD
Street Address/Road
LAKE DALE — HARDEE
City County
Subdivision Lot No.
36 33 25
Section Township Range

3. PURPOSE OF WELL: [X] Domestic [ ] Industrial [ ] Irrigation [ ] Stock [ ] Public Supply [ ] Other

4. TYPE OF WORK: [X] New Well [ ] Deepening [ ] Plugging [ ] Reconditioning [ ] Other

5. QUALITY: [X] Clear [ ] Colored [X] Sulfur [ ] Salty [ ] Other

CHECK TEST MADE
[X] None
Bacteria
Chemical
Chloride ___ PPM
(Check ___ if test was for sodium chloride)
Test By: [ ] County Health Dept. [ ] State Health Dept. [ ] U.S.G.S. [ ] Other
Name
Address
Temperature 72
Well Disinfected [X] Yes [ ] No

6. EQUIPMENT: [ ] Rotary [ ] Jet [X] Cable Tool [ ] Reverse Rotary [ ] Other

7. GROUT: [ ] None [ ] Cement [ ] Other

Describe and give number of bags (94lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4	Sch 40 BLACK IRON	0	55

(Check One) [ ] Threaded & Coupled [ ] Welded Only [ ] T & C & Welded [ ] Other

9. WATER LEVEL:
Water level after well completed 57 feet
[ ] Above [X] Below land surface
Well Flowing: [ ] Yes [X] No Flow ___ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)

11. UPPER END OF WELL: [X] Pump Installed [ ] Valve [ ] Cap [ ] Other

12. PUMPING TEST:
Date ___ [ ] Test Pump [ ] Permanent Pump
Measure point is ___
which is ___ feet [ ] above [ ] below land surface
Static water level ___ feet [ ] above [ ] below measure point
Maximum Drawdown ___ feet below measure point
Discharge at maximum drawdown ___ gal/min
After ___ hours

13. PUMP INSTALLED:
Type ___ Make ___ Model No. ___
Motor Power ___ Make ___ H.P. ___
Capacity ___ Gal/min at ___ ft. of total dynamic head
No. of bowls or stages ___
Pump setting ___ feet

14. WELL LOG:

Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.

Well bore (in)	Depth (feet) From	To	
4	0	37	SAND YELLOW
	37	54	CLAY GREEN
	54	58	ROCK GRAY
	58	90	CLAY GRAY
	90	92	ROCK, WHITE,
	92	121	CLAY GRAY
	121	134	ROCK GRAY
	134	175	ROCK BROWN
			BOTTOM OF HOLE 175'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on 3-20-76 and was completed on 3-25-76

DOUGLAS WD. 1065
Contractor License Number
Carl Douglas
Signature of Representative P.O. Box or Street
WAUCHULA HARDEE FLA.
City County State
7734615 Carl Douglas
Phone Number Driller

FORM: DNR/BW-2

SOUTHWEST FLC DA WATER MANAGEMENT D RICT (REGULATORY)

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

ief, Permits Department
ost Office Box 457
Brooksville, Florida 33512

Phone: (904) 796-3511

Date 1-22-75

(TYPE OR USE BALLPOINT PEN AND PRESS HARD)

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

DOUGLAS W.D. (DRILLING CONTRACTOR) 1065 (NUMBER) 604583 WAUCHULA FLA 33873 (ADDRESS)

requests authorization to construct a well for RONALD GILLIARD (NAME OF WELL OWNER)

ZOLFO BLD. CONT. (ADDRESS (MAILING) STREET OR BOX NO.) LAKE DALE (CITY) 33873 (ZIP CODE)

Well will be 4 inches in diameter. Proposed yield to be 170 GPM.

Well will be constructed with: [X] cable tool [ ] rotary [ ] jetted [ ] other (specify) ____________

Well will be approximately 155 feet deep. Well will have about 60 feet of casing

[X] black pipe [ ] galvanized [ ] other ____________

Casing will be joined by [X] coupling [ ] weld [ ] both. Space between casing and hole will be sealed with:

[X] natural materials [ ] neat cement grout [ ] other ____________

Well will be located at 36 33 25 (SECTION, TOWNSHIP, RANGE AND STREET ADDRESS) LAKE DALE (CITY) HARDEE (COUNTY)

Well will be used for: [X] private supply [ ] public water supply [ ] irrigation [ ] industrial

[ ] test well [ ] other ____________

If this permit is for repair, modification or alteration of a well constructed under a pervious permit give number

____________ and indicate work to be done ____________

____

I agree to furnish a log within 30 days after drilling operations cease and to comply with all provisions of the Rules and Regulations of the SWFWMD(R) and with local health regulations relative to well construction.

Signature of Drilling Contractor Carl Douglas

I hereby consent to be regulated by Southwest Florida Water Management District and by Southwest Florida Water Management District (Regulatory) regarding consumptive use of water and allocation thereof, and if this permit is granted I agree to comply with the conditions set forth on the reverse side of this form. Access to proposed well site for inspection at any reasonable time is hereby granted personnel of SWFWMD and SWFWMD(R).

Signature of Owner or his authorized Agent Ronald Gilliard

DO NOT WRITE BELOW THIS LINE -- FOR SWFWMD(R) USE ONLY

PERMIT TO CONSTRUCT A WELL 75 4340-20

Review of the above application and related hydrologic data has been made by a duly authorized official of the Southwest Florida Water Management District (Regulatory) and subject to conditions set forth on the reverse side of this form permission for construction of this well is granted in accordance with the Rules and Regulations of SWFWMD(R).

All drilling shall be performed by, or in the presence of, a certified driller and a copy of the well log will be submitted to this office within 30 days after drilling operations cease. In addition to these provisions, compliance with the special item number(s) ____________, as described on the reverse side of this form, shall be required.

This permit does not imply approval of sewage or other waste disposal facilities, or of water supply and other facilities in the area to be supplied by the well.

Granted by: [signature] Date 1-24-75

Title ____________

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED AND SEALED BY AN AUTHORIZED OFFICER OF SWFWMD(R) AND SHALL BE MAINTAINED AT THE WELL SITE DURING ALL DRILLING OPERATIONS,

PROMINENTLY DISPLAYED

SWFWMD (R)
SF 1710 REV. 1/2/74

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
505 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-8476

Permit No. 75-4584-2C

Owner's Well Identification ______

№ 14991

For Department Use ONLY — State Well Number

1. OWNER: Ronald Gilliard
Name
Elm St. Zolfo Springs Fla.
Address City State

2. LOCATION OF WELL: ______
Street Address/Road
City ______ County HARDEE
Subdivision Lake Dale Lot No. 104
Section 36 Township 33S Range 25E

3. PURPOSE OF WELL:
☒ Domestic ☐ Irrigation ☐ Public Supply
☐ Industrial ☐ Stock ☐ Other ______

4. TYPE OF WORK:
☒ New Well ☐ Plugging ☐ Other ______
☐ Deepening ☐ Reconditioning

5. QUALITY:
☒ Clear ☐ Colored ☐ Sulfur ☐ Salty ☐ Other ______

CHECK TEST MADE
☒ None
☐ Bacteria
☐ Chemical
Chloride ______ PPM
(Check ☐ if test was for sodium chloride)
Temperature ______ °F
Test By:
☐ County Health Dept.
☐ State Health Dept.
☐ U.S.G.S.
☒ Other Thomas Edenfield
Name
Zolfo Springs, Fla.
Address
Well Disinfected ☐ Yes ☒ No

6. EQUIPMENT:
☐ Rotary ☒ Cable Tool ☐ Other ______
☐ Jet ☐ Reverse Rotary

7. GROUT: ☒ None ☐ Cement ☐ Other

Describe and give number of bags (94) lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4"	Black Steel	0	53

(Check One) ☐ Threaded & Coupled ☐ Welded Only
☒ T & C & Welded ☐ Other

9. WATER LEVEL:
Water level after well completed 36 feet
☐ Above ☒ below land surface
Well Flowing: ☐ Yes ☒ No Flow ______ gal/min

10. SCREENS:

Make	Materials	Diameter (in.)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)
	None				

11. UPPER END OF WELL:
☒ Pump Installed ☐ Valve ☐ Cap ☐ Other

12. PUMPING TEST:
Date May 15, 1975 ☐ Test Pump ☒ Permanent Pump
Measure point is Top of pipe
which is 1 feet ☒ above ☐ below land surface
Static water level 36 feet ☐ above ☐ below measure point
Maximum Drawdown ____ feet below measure point
Discharge at maximum drawdown ______ gal/min
After ______ hours

13. PUMP INSTALLED:
Type Sub. Make Sears Model No. 2866
Motor Power Elect 1/2 Make Sears H.P. 1/2
Capacity 20 Gal/min at 4 ft. of total dynamic head
No. of bowls or stages ______

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	8	Sand
	8	29	Marl
	29	52	Sandy Clay + HARD Stone
	52'	180'	HARD Lime + Limey Clay

T.D. - 180'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on May 15 and was completed on May 25 1975

Edenfield Well Drilling 1052
Contractor License Number
Thomas W. Edenfield 150
Signature of Representative P.O. Box ~~or Street~~
Zolfo Springs HARDEE Fla 33890
City County State
735-1118 Phillip Edenfield
Phone Number Driller

FORM: DNR/B

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION
OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
505 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-8476

4585
Per. No. 75-4584

Owner's Well Identification

ONLY

Nº 14988

1. OWNER: Ronald Gilliard
Name
Elgal Zolfo Springs Fla.
Address City State

2. LOCATION OF WELL:
Street Address/Road
HARDEE
City County
LakeDale 101
Subdivision Lot No.
36 33S 25E
Section Township Range

3. PURPOSE OF WELL:
☒ Domestic ☐ Irrigation ☐ Public Supply
☐ Industrial ☐ Stock ☐ Other

4. TYPE OF WORK:
☒ New Well ☐ Plugging ☐ Other
☐ Deepening ☐ Reconditioning

5. QUALITY:
☒ Clear ☐ Colored ☐ Sulfur ☐ Salty ☐ Other

CHECK TEST MADE
☒ None
☐ Bacteria
☐ Chemical
Chloride ____ PPM
(Check ☐ if test was for sodium chloride)
Temperature ____ °F
Test By:
☐ County Health Dept.
☐ State Health Dept.
☐ U.S.G.S.
☒ Other Thomas Edwfield
Name
Zolfo Springs, Fla.
Address
Well Disinfected ☐ Yes ☒ No

6. EQUIPMENT:
☐ Rotary ☒ Cable Tool ☐ Other
☐ Jet ☐ Reverse Rotary

7. GROUT: ☒ None ☐ Cement ☐ Other

Describe and give number of bags (94)lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches)	Kind	From (ft)	To (ft)
4"	Black steel	0'	68'

(Check One) ☐ Threaded & Coupled ☐ Welded Only
☒ T & C & Welded ☐ Other

9. WATER LEVEL:
Water level after well completed 40 feet
☐ Above ☒ below land surface
Well Flowing: ☐ Yes ☒ No Flow ____ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)
		None			

11. UPPER END OF WELL:
☒ Pump Installed ☐ Valve ☐ Cap ☐ Other

12. PUMPING TEST:
Date April 15, 1975 ☐ Test Pump ☒ Permanent Pump
Measure point is Top of pipe
which is 1 feet ☒ above ☐ below land surface
Static water level 40 feet ☐ above ☐ below measure point
Maximum Drawdown ____ feet below measure point
Discharge at maximum drawdown ____ gal/min
After ____ hours

13. PUMP INSTALLED:
Type Sub Make Sears Model No. 2866
Motor Power Elec Make Sears H.P. 1/2
Capacity 16 Gal/min at 40 ft. of total dynamic head
No. of bowls or stages ____
Pump setting 84 feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	7'	Sand
	7	28	Marl
	28	67	Sandy Green clay & Sand
	67'	185	Hard lime & Shiny clay

T.D. 185'

15. CONTRACTOR'S CERTIFICATION:
This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on April 11, 1975 and was completed on April 15, 1975

Edwfield Well Drilling 1052
Contractor License Number
Thomas W Edwfield 150
Signature of Representative P.O. Box or Street
Zolfo Springs, HARDEE Fla. 33890
City County State
735-1181 Phillip Edwfield
Phone Number Driller

STATE OF FLORIDA
WATER WELL CONTRACTOR'S NOTIFICATION OF CONSTRUCITON OR REPAIR OF A WATER WELL
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF INTERIOR RESOURCES
565 Larson Building, Tallahassee, Florida 32304
Telephone: (904) 488-6476

Permit No. 75-8926-20
Owner's Well Identification 1087
Nº 15277

For Department Use ONLY — State Well Number

1. OWNER: William Smith Jr.
Name
Rt 2 Apt Rd Wauchula Fla
Address City State

2. LOCATION OF WELL: 3 miles N. on Airport Rd.
Street Address/Road
Wauchula Hardee
City County
Subdivision Lot No.
36 33S 25E
Section Township Range

3. PURPOSE OF WELL:
☑ Domestic ☐ Irrigation ☐ Public Supply
☐ Industrial ☐ Stock ☐ Other

4. TYPE OF WORK:
☑ New Well ☐ Plugging ☐ Other
☐ Deepening ☐ Reconditioning

5. QUALITY:
☑ Clear ☐ Colored ☐ Sulfur ☐ Salty ☐ Other

CHECK TEST MADE
☑ None
☐ Bacteria
☐ Chemical
Chloride ____ PPM
(Check ☐ if test was for sodium chloride)
Temperature ____ °
Test By:
☐ County Health Dept.
☐ State Health Dept.
☐ U.S.G.S.
☐ Other
Name
Address
Well Disinfected ☐ Yes ☐ No

6. EQUIPMENT:
☐ Rotary ☑ Cable Tool ☐ Other
☐ Jet ☐ Reverse Rotary

7. GROUT: ☑ None ☐ Cement ☐ Other

Describe and give number of bags (94 lb.)	From (ft)	To (ft)

8. CASING AND LINER PIPE:

Diameter (inches) Kind	From (ft)	To (ft)
4 inch black steel	0	50
open hole	50	205

(Check One) ☐ Threaded & Coupled ☑ Welded Only
☐ T & C & Welded ☐ Other

9. WATER LEVEL:
Water level after well completed 36 feet
☐ Above ☑ Below land surface
Well Flowing: ☐ Yes ☑ No Flow ____ gal/min

10. SCREENS:

Make	Materials	Diameter (in)	Slot Size	Location (ft) Below Surface From (ft)	To (ft)
NONE					

11. UPPER END OF WELL:
☑ Pump Installed ☐ Valve ☐ Cap ☐ Other

12. PUMPING TEST:
Date 8-14-75 ☐ Test Pump ☑ Permanent Pump
Measure point is Top of 4" csg
which is 4' feet ☑ above ☐ below land surface
Static water level 36 feet ☐ above ☑ below measure point
Maximum Drawdown 5 feet below measure point
Discharge at maximum drawdown 30 gal/min
After 2 hours

13. PUMP INSTALLED:
Type Submersible Make Myers Model No.
Motor Power 1 1/2 Make Electric H.P. 1 1/2
Capacity 30 Gal/min at ____ ft. of total dynamic head
No. of bowls or stages
Pump setting 80 feet

14. WELL LOG:

Well bore (in)	Depth (feet) From	To	Note each type of material, producing zones, & cavities if any. Give description at not less than 20 foot intervals and at changes.
4	0	20	sand
4	20	30	Fullers Earth
4	30	40	Blue clays
4	40	50	Blue clay & Rock
4	50	80	White Clay & Rock
4	80	150	same as above
4	150	205	Tampa Lime Rock

15. CONTRACTOR'S CERTIFICATION:

This work was done under my jurisdiction and this report is true to the best of my knowledge and belief. The work commenced on 7-31-75 and was completed on 8-15-75

George Dansby Well Drilling 1087
Contractor License Number
[signature] V.P. 310 Carlton St.
Signature of Representative P.O. Box or Street
Wauchula Hardee Co. Fla
City County State
813-773-6977 Dan Dansby
Phone Number Driller

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (REGULATORY)
2379 Broad Street, Brooksville, Florida 33512-9712
904/796-7211

148925

APPLICATION FOR A PERMIT TO CONSTRUCT A WELL

In compliance with the Rules and Regulations of the Southwest Florida Water Management District (Regulatory)

PERMIT NO.: 408523-20

STIPULATIONS REQUIRED: (See Reverse)

DATE: 9/26/85

CAESAR BLACKBURN	9050
DRILLING CONTRACTOR	LICENSE NUMBER
601 South 11th Ave Wauchula FLA	
ADDRESS STREET OR BOX NO. CITY	ZIP CODE

(PLEASE TYPE OR PRINT IN ABOVE SPACE)

Requests authorization to construct, repair, modify a well for: (Circle One)

George W. Drake at Summer Road (see legal)
NAME OF WELL OWNER — ADDRESS OF WELL LOCATION — STREET OR BOX NO. — CITY — ZIP CODE

Box 1182 Wauchula FLA 33873
OWNERS MAILING ADDRESS — STREET OR BOX NO. — CITY — ZIP CODE

TYPE OF EQUIPMENT: Rotary

APPROXIMATE DEPTH: 220 DIAMETER: 4"

APPROXIMATE CASED DEPTH: 60 CASING MATERIAL: PVC

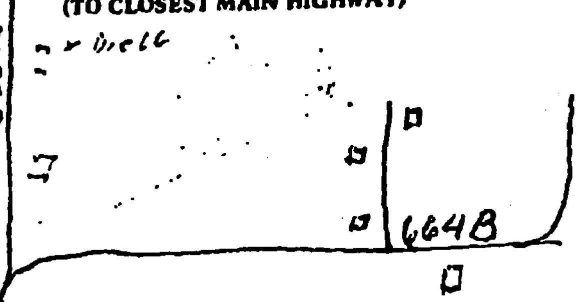
SEAL: Cement PURPOSE: Home

LEGAL DESCRIPTION:
QTR. SE QTR. NW SEC. 36 TWP. 33 S. RGE. 25 E.

LOT ____ BLK. ____ UNIT ____ SUBDIVISION ____

COUNTY: Hardee

LOCATION SKETCH (TO CLOSEST MAIN HIGHWAY)



I agree to furnish a Completion Report within 30 days after drilling operations cease and to comply with all the provisions of the Rules and Regulations of the SWFWMD(R) relative to well construction. Driller should supply a copy of the Completion Report to the owner.

I understand if the withdrawal is from a well having an inside diameter of six inches (6") or more or if the withdrawal during any single day is to exceed one-million (1,000,000) gallons or if the average annual daily withdrawal is to exceed one hundred thousand (100,000) gallons average per day on an annual basis, then a Consumptive Use Permit must be approved prior to the Construction Permit being authorized.

Signature of Drilling Contractor Caesar Blackburn

Signature of Owner or His Authorized Agent Caesar Blackburn

DO NOT WRITE BELOW THIS LINE—FOR OFFICIAL USE ONLY

GRANTED BY: R. W. Pickels DATE: 9/26/85

TITLE: Supervisor, Enforcement

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED BY AN AUTHORIZED OFFICER OF SWFWMD(R). IT SHALL BE KEPT AT THE WELL SITE DURING ALL DRILLING OPERATIONS.

RECEIVED SEP 30 1985 WELL PERMITTING — Southwest Florida Water Management District Regulatory

IMS UPDATE OCT 3 1985

CUP NO. ________

SWFWMD(R)
SF 306(3) Rev. 4/79

Form No. 26-10-4/83

STATE OF FLORIDA PERMIT APPLICATION TO CONSTRUCT, REPAIR, MODIFY, OR ABANDON A WELL

☐ Southwest
☐ Northwest
☐ St. Johns River
☐ South Florida
☐ Suwannee River

CHECK BOX FOR APPROPRIATE DISTRICT. ADDRESS ON BACK OF PERMIT FORM.

THIS FORM *MUST* BE FILLED OUT COMPLETELY.

The water well contractor is responsible for completing this form and forwarding the permit to the appropriate delegated county where applicable.

Permit No. 600529-01
Florida Unique I.D.
Permit Stipulations Required (See attached) #39
62-524 well ☐
CUP/WUP Application No.

DO NOT USE THIS LINE FOR OFFICIAL USE ONLY

1. PAUL DUMONT + JOHN HETTINGA P.O BOX 2581 WAUCHULA FLA. 33873
Owner, Legal Name of Entity if Corporation — Address — City — Zip — Telephone Number

2. 565 BOYD COWART ROAD
Well Location — Address, Road Name or Number, City

3. EARL GASKINS Well Drilling — 941-773-2422
Well Drilling Contractor — Telephone No.
P.O BOX 1544 — 2381
Address — License No.
WAUCHULA, FLA. 33873
City — State — Zip

4. SE 1/4 of SE 1/4 of Section 31
(smallest) (biggest)
(Indicate Well on Chart)

NW NE
X
SW SE

5. Township 33S Range 25E

6. HARDEE
County — Subdivision Name — Lot — Block — Unit

7. Number of proposed wells 1 Check the use of well: (See back of permit for additional choices) ✓ Domestic Monitor (type) ____
____ Irrigation (type) (See Back) Public Water Supply (type) ____ List Other ____
Distance from septic system 75' ft. Description of facility (See Back) TRAILER Estimated start of construction date 12-16-97

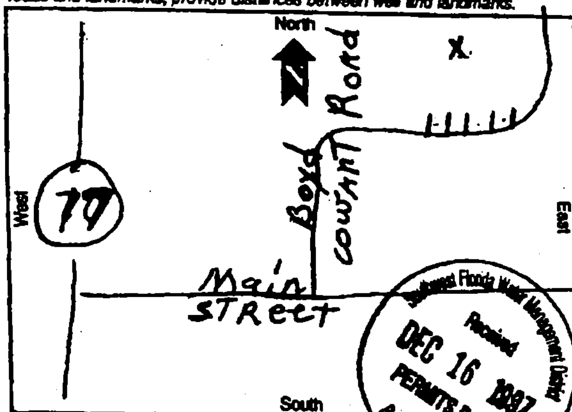
8. Application for: ✓ New Construction ____ Repair/Modify ____ Abandonment ____
(Reason for Abandonment)

Southwest Florida Water Management District
Received
Data Stamp
DEC 15 '97
Bartow Reg.
Bartow, Florida

9. Estimated: Well Depth 200' Casing Depth 84' Screen Interval from ____ to ____
Casing Material: Blk-Steel / Gal / PVC Casing Diameter ____ Seal Material Cement

10. If applicable: Proposed Grouting Interval
From 0' to 84' Seal Material Cement
From ____ to ____ Seal Material ____
From ____ to ____ Seal Material ____

Draw a map of well location and indicate well site with an "X". Identify known roads and landmarks; provide distances between well and landmarks.



11. Telescope Casing ____ or Liner ____ (check one) Diameter 5"
Blk-Steel / Galvanized / PVC Other (specify: ____

12. Method of Construction: ✓ Rotary ____ Cable Tool ____ Combination
____ Auger ____ Other (specify:) ____)

13. Indicate total No. of wells on site 0. List number of unused wells on site 0.

14. Is this well or any other well or water withdrawal on the owner's contiguous property covered under a Consumptive/Water Use Permit (CUP/WUP) or CUP/WUP Application? ____ No ____ Yes
(If yes, complete the following) CUP/WUP No. ____
District well I.D. No. ____
Latitude ____ Longitude ____
Data obtained from GPS ____ or map ____ or survey ____ (*map datum NAD 27* ____ *NAD 83* ____)

Southwest Florida Water Management District
Received
DEC 16 1997
PERMITS DATA
Brooksville, Florida

15. I hereby certify that I will comply with the applicable rules of Title 40, Florida Administrative Code, and that a water use permit or artificial recharge permit, if needed, has been or will be obtained prior to commencement of well construction. I further certify that all information provided on this application is accurate and that I will obtain necessary approval from other federal, state, or local governments, if applicable. I agree to provide a well completion report to the District within 30 days after drilling or the permit expiration, whichever occurs first.

Earl Gaskins 2381
Signature of Contractor — License No.

I certify that I am the owner of the property, that the information provided is accurate, and that I am aware of my responsibilities under Chapter 373, Florida Statutes, to maintain or properly abandon this well, or, I certify that I am the agent for the owner, that the information provided is accurate, and that I have informed the owner of his responsibilities as stated above. Owner consents to personnel of the WMD or a representative access to the well site.

Earl Gaskins
Owner's or Agent's Signature — Date

DO NOT WRITE BELOW THIS LINE — FOR OFFICIAL USE ONLY

Approval Granted By: [signature] Issue Date: 12-15-97 Hydrologist Approval ____ Initials
Owner Number: 247619 Fee Received: $ 50.- Receipt No. 98004471A Check No.: 2393

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED BY AN AUTHORIZED OFFICER OR REPRESENTATIVE OF THE WMD. IT SHALL BE AVAILABLE AT THE WELL SITE DURING ALL DRILLING OPERATIONS. ***This permit is valid for 90 days from date of issue.***

FORM 41.10 – 410 (1) REV. 4/95

WHITE: ORIGINAL FILE
YELLOW: DRILLING CONTRACTOR
PINK: OWNER

Fold at this line in order that address is visible through envelope window

BEST AVAILABLE COPY

WELL COMPLETION REPORT (Please complete in black ink or type.)

PERMIT # 600529-01 WUP # ____ DID # ____

If permit is for multiple wells indicate the number of wells drilled ____

Indicate remaining wells to be cancelled ____

WATER WELL CONTRACTOR'S SIGNATURE Earl Gaskins License # 2381

I certify that the information provided in this report is accurate and true.

Grout	No. of Bags	From (Ft.)	To (Ft.)
Neat Cement:	21 Bags	0'	60'
Bentonite:			

WELL LOCATION: County Hardee Sec: 36 Twp: 33S Rge: 25E

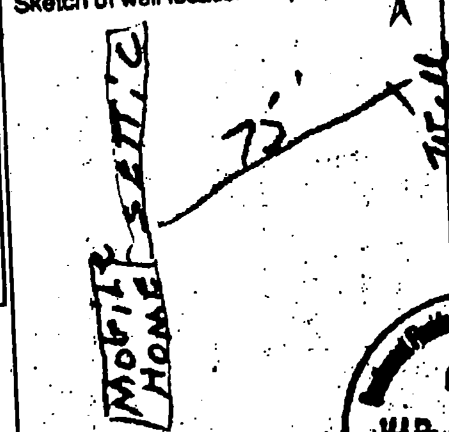
Qtr: ____ Qtr: ____

DATE STAMP

Southwest Florida Water Management District
Received
FEB 27 '98
Bartow Reg.
Bartow, Florida

Official Use Only

Sketch of well location on property N



Give distances from septic tank and other reference points

CHEMICAL ANALYSIS

Iron: ____ ppm Sulfate: ____ ppm

Chlorides: ____ ppm

[ ] Lab Test [ ] Field Test Kit

Pump Type

[ ] Centrifugal [ ] Jet [ ] Submersible [ ] Turbine

Horsepower ____ Capacity ____ G.P.M. ____

Pump Depth ____ Ft. Injection Depth ____ Ft.

Form 41.10-410(2) Rev. 4/95

OWNER'S NAME Paul Dumonit + John [illegible]ttinga

COMPLETION DATE 2-13-98 Florida Unique I.D. ____

WELL USE: DEP/Public ____ Irrigation ____ Domestic ✓ Monitor ____

HRS Limited ____ 62-524 ____ Other ____

DRILL METHOD [✓] Rotary [ ] Cable Tool [ ] Combination

[ ] Jet [ ] Auger Other ____

Measured Static Water Level 40' Measured Pumping Water Level ____

After ____ Hours at ____ G.P.M. Measuring Pt. (Describe): ____

Which is ____ Ft. [ ] Above [ ] Below Land Surface

Casing: [ ] Black Steel [ ] Galv. [✓] PVC Other ____

[✓] Open Hole [ ] Screen — Depth (Ft.) 140

DRILL CUTTINGS LOG Examine cuttings every 20 ft. or at formation changes. Give color, grain size, and type of material. Note cavities, depth to producing zones.

Casing Diameter & Depth (Ft.)	From	To	Drill Cuttings Log
Diameter 5"	0'	10'	Sand
From 0'	10'	30'	Brown Clay
To 60'	30'	50	White Clay
	50'	60'	White Clay & Rock
Diameter ____	60'	80'	Rock & White lime
From ____	80'	100'	White lime
To ____	100'	120'	White lime
	120'	140'	" "
Liner [ ] or Casing [ ]	140'	160'	White lime & Brown rock
Diameter ____	160'	180'	White lime
From ____	180'	200'	White lime & rock
To ____			

Southwest Florida Water Management District
Received
MAR 2 1998
PERMITS DATA
Brooksville, Florida

Driller's Name: (print or type) Earl Gaskins

STATE OF FLORIDA PERMIT APPLICATION TO CONSTRUCT, REPAIR, MODIFY, OR ABANDON A WELL

☒ Southwest
☐ Northwest
☐ St. Johns River
☐ South Florida
☐ Suwannee River

CHECK BOX FOR APPROPRIATE DISTRICT ADDRESS ON BACK OF PERMIT FORM

THIS FORM *MUST* BE FILLED OUT COMPLETELY.

The water well contractor is responsible for completing this form and forwarding the permit to the appropriate delegated county where applicable

Permit No. 680590.01
Florida Unique I.D.
Permit Stipulations Required (See attached) 31 39 045
62-524 well ☐
CUP/WUP Application No

ABOVE THIS LINE FOR OFFICIAL USE ONLY

1. CHARLES E. + GAIL D. BEST P.O. BOX 203 WAUCHULA, FL. 33873
Owner, Legal Name of Entity if Corporation | Address | City | Zip | Telephone Number

2. APP 4.2 M EAST-NORTHEAST OF WAUCHULA, AT INTERSECTION OF SR HWY 664 B + SUMMER RD
Well Location — Address, Road Name or Number, City

3. DOUGLAS WELL DRILLING 9127
Well Drilling Contractor | License No. | Telephone No

2404 GREENLEAF ROAD
Address

ZOLFO SPRINGS, FL. 33890
City | State | Zip

4. 2 (smallest) 1/4 of 2 (biggest) 1/4 of Section 36 (Indicate Well on Chart)

5. Township 33 Range 25

NW NE X SW SE

6. HARDEE
County | Subdivision Name | Lot | Block | Unit

7. Number of proposed wells 1 Check the use of well: (See back of permit for additional choices) ____ Domestic Monitor (type) ____
X Irrigation (type) (See Back) Public Water Supply (type) ____ (See Back) List Other ____
Distance from septic system ____ ft Description of facility ____ Estimated start of construction date 2-03

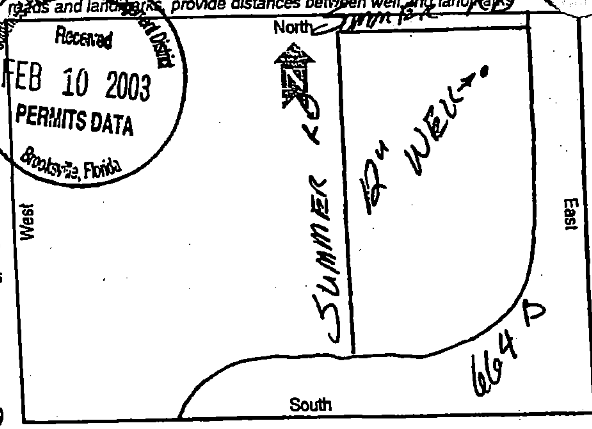
8. Application for: X New Construction ____ Repair/Modify ____ Abandonment ____ (Reason for Abandonment)

Southwest Florida Water Management District Received Date Stamp FEB 06 '03 Bartow Reg. Service Office

9. Estimated: Well Depth 1000' Casing Depth 380' Screen Interval from ____ to ____
Casing Material: Blk-Steel / Gal / PVC Casing Diameter 12" Seal Material CEMENT

10. If applicable: Proposed Grouting Interval
From ____ to ____ Seal Material ____
From ____ to ____ Seal Material ____
From ____ to ____ Seal Material ____

Draw a map of well location and indicate well site with an "X". Identify known roads and landmarks, provide distances between well and landmarks



Southwest Florida Water Management District Received FEB 10 2003 PERMITS DATA Brooksville, Florida

11. Telescope Casing ____ or Liner ____ (check one) Diameter ____
Blk-Steel / Galvanized / PVC Other (specify. ____

12. Method of Construction: X Rotary ____ Cable Tool ____ Combination
____ Auger ____ Other (specify ____)

13. Indicate total No. of wells on site 0. List number of unused wells on site 0.

14. Is this well or any other well or water withdrawal on the owner's contiguous property covered under a Consumptive/Water Use Permit (CUP/WUP) or CUP/WUP Application? ____ No X Yes
(If yes, complete the following) CUP/WUP No. 20012395.000
District well I.D No. ////
Latitude 273416.45 Longitude 814544.08
Data obtained from GPS ____ or map ____ or survey ____ (map datum NAD 27 ____ NAD 83 ____)

15. I hereby certify that I will comply with the applicable rules of Title 40, Florida Administrative Code, and that a water use permit or artificial recharge permit, if needed, has been or will be obtained prior to commencement of well construction. I further certify that all information provided on this application is accurate and that I will obtain necessary approval from other federal, state, or local governments, if applicable. I agree to provide a well completion report to the District within 30 days after drilling or the permit expiration, whichever occurs first.

[signature] 9127
Signature of Contractor | License No

I certify that I am the owner of the property, that the information provided is accurate, and that I am aware of my responsibilities under Chapter 373, Florida Statutes, to maintain or properly abandon this well, or, I certify that I am the agent for the owner, that the information provided is accurate, and that I have informed the owner of his responsibilities as stated above. Owner consents to personnel of the WMD or a representative access to the well site.

[signature] 2-4-03
Owner's or Agent's Signature | Date

DO NOT WRITE BELOW THIS LINE — FOR OFFICIAL USE ONLY

Approval Granted By: Susan M Bracker Issue Date: 2-7-2003 Hydrologist Approval ____ Initials

Owner Number. 249064 Fee Received. $ 50.00 Receipt No. BA03-00818A Check No.:

Enter numerical month, day and full, four-digit year.

THIS PERMIT NOT VALID UNTIL PROPERLY SIGNED BY AN AUTHORIZED OFFICER OR REPRESENTATIVE OF THE WMD. IT SHALL BE AVAILABLE AT THE WELL SITE DURING ALL DRILLING OPERATIONS *This permit is valid for 90 days from date of issue.*

WHITE: ORIGINAL FILE
YELLOW: DRILLING CONTRACTOR
PINK OWNER

FORM 41 10 – 410 (1) REV 4/95

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